

MARCH/APRIL 2002

Zoogoer

VOLUME 31 / NUMBER 2



*
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preserve more than
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In an effort to secure their future in China and North America, Fujifilm is proud to sponsor the future home of two giant pandas at the Smithsonian's National Zoo. Two-and-a-half year old Mei Xiang and three-and-a-half year old Tian Tian will be housed in a state-of-the-art facility under the care of the National Zoo. Fujifilm recognizes that although photography is wonderful for preserving memories, it can never replace the real thing. www.fujifilm.com

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MISSION POSSIBLE

The last few months at the National Zoo have been amazing! With the births of a Sumatran tiger, a western lowland gorilla, and an Asian elephant, we've watched the Zoo grow younger. What a treat this has been for our members, the public, and the FONZ and Zoo staff. And, of course, we can't forget that our charming giant panda pair, whose first year at the Zoo we celebrated in January, are young too. All of this makes for a very lively Zoo.



These youngsters have attracted an enormous amount of attention, and in this issue of *ZooGoer* we share the details of the extensive research effort it took to make the elephant birth successful. You can also read why this birth is so important and what it means to the National Zoo's future, including plans for the Asia Trail.

Less well known is another success story that is explored in this issue. In 1997, the Zoo became only the fifth in the world to breed kori bustards, big showy birds of African grasslands. Since then, 15 chicks have grown to adulthood here. Koris, along with many of the other 24 species of bustards, are declining in the wild. A healthy zoo population will offer insurance against this species's extinction. Having these birds in the Zoo also increases public awareness of their conservation needs. What's more, it exposes people to a fascinating, diverse group of birds and the Zoo's research on the koris. An article about this begins on page 22.

Another article in *ZooGoer* tells a beaver tale. Our beaver pair produced three offspring two years ago, giving visitors an opportunity to see a beaver family in action. This is something very difficult for anyone to see in the wild, even though beavers are fairly common in wetland habitats in the United States. But when the National Zoo was founded more than 100 years ago, beavers were nearly extinct, victims largely of an uncontrolled fur trade. In fact, when the Zoo first exhibited beavers there were no wild ones in Rock Creek. Reportedly, though, in the early part of the last century some beavers escaped from the Zoo and took up residence there. Today, beavers have rebounded throughout the country thanks to effective conservation action, especially the regulation of trapping them for their fur. We are striving to find equally successful conservation solutions for the plights of pandas, tigers, elephants, great apes, and other endangered animals.

These species and their stories, each in their own way, represent how the National Zoo is fulfilling its mission to study, celebrate, and help protect the diversity of animals and their habitats. With FONZ's support, the National Zoo works hard to do this, but we can't do it alone. We need your help.

There are many ways for members to get more involved throughout the year. But two of the most enjoyable are coming up in May. National ZooFari, our annual fundraising gala, is a spectacular party that is a highlight of Washington's spring season. More than 110 fine restaurants, including Galileo da Roberto Donna, CESCO, and Kinkead's, and vintners serve fine food and wine. There is musical entertainment for every taste and animal demonstrations that let guests meet some Zoo residents up close. Best of all, this year we will be "watching the Zoo grow young" with the theme "Offspring Fling." Mark your calendars for the evening of May 16.

But that's not all. For human youngsters, we offer Guppy Gala, a fundraiser for kids and their families on the evening of May 10. At Guppy Gala, the food and entertainment, from cotton candy to clowns, appeal to kids, but everyone has fun and helps the Zoo at the same time.

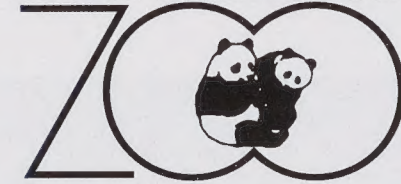
Look for more details about these great events on page 6, then reserve your tickets today. I look forward to seeing you in May. Thank you for your continued support of your National Zoo.

Sincerely,

Clinton A. Fields
Executive Director

P.S. Purchase your ZooFari and Guppy Gala tickets online. It's fast, convenient, and secure. Log onto <http://www.fonz.org>.

Friends of the National



is a nonprofit organization of individuals, families, and organizations who are interested in helping to maintain the status of the Smithsonian National Zoological Park as one of the world's great

zoos, to foster its use for education, research, and recreation, to increase and improve its facilities and collections, and to advance the welfare of its animals.

ZooGoer [ISSN 0163-416X] is published bimonthly by Friends of the National Zoo (offices located at the Smithsonian National Zoological Park, 3001 Connecticut Ave., N.W., Washington, DC 20008-2537) to promote its aims and programs, and to provide information about FONZ activities to its members, volunteers, and others interested in the purposes of FONZ. Periodicals postage paid at Washington, D.C. Postmaster: Send change of address to *ZooGoer*, 3001 Connecticut Ave. NW, Washington, DC 20008-2537. Copyright 2002. All rights reserved.

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Membership in FONZ offers many benefits: publications, discounts on shopping, programs, and events, free parking, and invitations to special programs and activities to make zoogoing more enjoyable and educational. To join, write FONZ Membership, National Zoological Park, Washington, DC 20008, call 202.673.4961 or go to www.fonz.org.

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Cover photo: Asian elephant Kandula at five days of age. Photo by Jessie Cohen/NZP.

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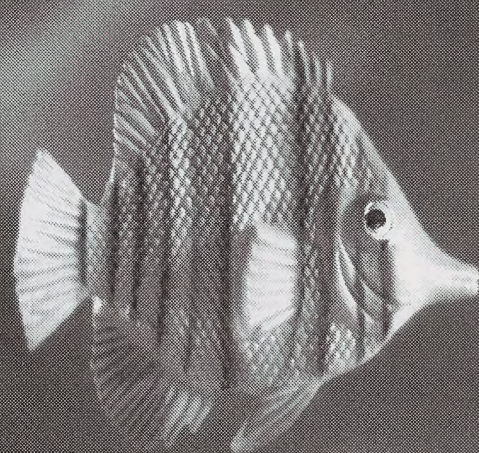
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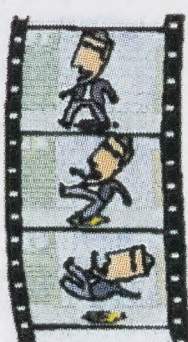
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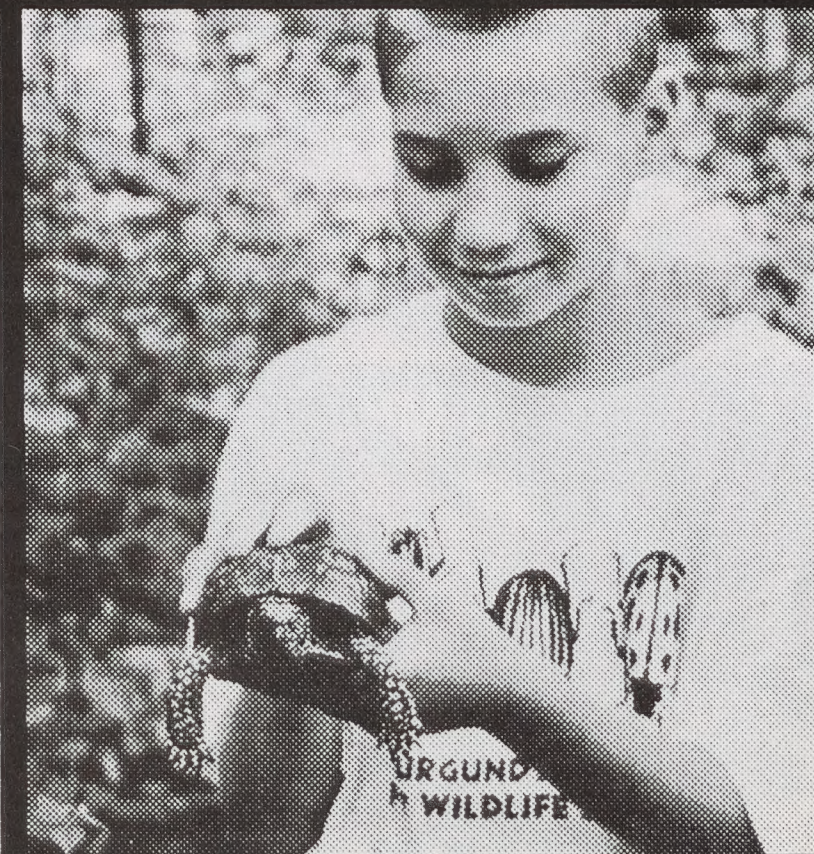
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ANIMAL NEWS>>

It's a boy! The lowland gorilla born last November at the National Zoo has finally been determined to be male. For nearly two months, the infant's mother, Mandara, held her son in such a way that Zoo staff couldn't tell its sex for certain. Fathered by Kuja, the as-yet-unnamed male is the fifth offspring born to "supermom" Mandara. Read about plans for naming the baby gorilla (*Gorilla gorilla gorilla*) on the FONZ website, www.fonz.org, and Zoo website, nationalzoo.si.edu

Near the Great Ape House, a dark, hairy stranger named Bradley has swung into town. Bradley is a five-year-old male siamang (*Hylobates syndactylus*) born at the Primate Rescue Center in Nicholasville, Kentucky. He will be a nonbreeding companion for the Zoo's 21-year-old female siamang, Salem, who has been alone in her Gibbon Ridge exhibit since her father, Sam, died in February 2001. Visitors may need to wait for the weather to warm up before they can see Salem and

Bradley singing and swinging outdoors. In the wild, this endangered ape species inhabits tropical forest canopies in Sumatra and the Malay Peninsula.

Meanwhile, Africa is in the air at the Zoo's Bird House. A multi-species indoor exhibit highlighting the diversity of Africa's avian fauna has recently been created. The



MANDARA WITH INFANT.



LILAC-BREASTED ROLLER.

large enclosure is home to a pair of red-billed hornbills (*Tockus erythrorhynchus*), three white-backed mousebirds (*Colius colius*), a pair of lilac-breasted rollers (*Coracias caudata*), and one black crane (*Limnocorax flavirostra*). Another native of Africa, the male Schalow's turaco (*Tauraco livingstoni*) currently on exhibit in this area of the Bird House, will soon be transported to the Dallas Zoo in hopes he will breed with a female turaco there.

Outside the Bird House, the male and female peafowl (*Pavo cristatus*) that were once found behind the building have moved to an area at the top of Valley Trail, near the Andean condor exhibit. Native to the Indian subcontinent, the peafowl may eventually become part of the Zoo's planned Asia Trail.

SPRING FORWARD!

As trees begin to unfurl their leaves, FONZ is budding with special events to celebrate and support the animals at the National Zoo. The annual **Seal Days**

weekend kicks off our spring season on **March 23** and **24** from 10 a.m. to 4 p.m. This event, which highlights the biology and conservation of North American wildlife, will include



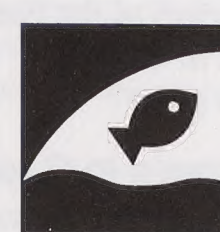
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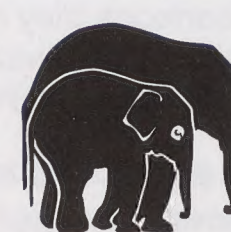
African-American
Family Celebration:
April 1



Focus on Science
Weekend:
April 20-21



Guppy Gala:
May 10



ZooFari:
"Offspring Fling"
May 16

keeper talks and demonstrations, educational games and activities, and great food.

Another free family event, the **African-American Family Celebration**, follows on **April 1**, from 10 a.m. to 5 p.m. This traditional Easter Monday festival will feature an Easter egg hunt, gospel music, African drum performances, and tempting fare to sample.

Next up, FONZ's **Focus on Science Weekend** unfolds at the Zoo on Saturday and Sunday, **April**

20 and 21, from 11 a.m. to 4 p.m. On each day, children can explore "Find Out Why?" learning activities, set up as stations on a gigantic game board, that pose questions about animal biology and behavior.

Finally, the month of May delivers FONZ's fantastic annual fundraisers: **Guppy Gala** on Friday, **May 10**, from 6:00 to 8:30 p.m. and **ZooFari: "Offspring Fling"** on Thursday, **May 16**, from 6:30 to 11:00 p.m. Tickets to Guppy Gala are \$18 for member adults and chil-

dren two years and older, and \$25 for nonmember children and adults. Advance sale tickets to ZooFari are \$100 for FONZ members and \$125 for nonmembers until April 30. Beginning May 1, tickets are \$110 for members and \$135 for nonmembers (\$70 is tax deductible). Log onto www.fonz.org or call 202.673.4613 to order tickets or for more information about either of these two spectacular soirees.



CALIFORNIA SEA LIONS (*ZALOPHUS CALIFORNIANUS*).

MASAI GIRAFFE AT THE NATIONAL ZOO.

PICKY AND PRICKLY

With six-foot-long legs, six-foot-long necks, and tongues 18 inches in length, giraffes (*Giraffa camelopardalis*) are supremely adapted for foraging for leaves as much as 20 feet above the ground. These African savanna animals are incapable, however, of drinking from watering holes without awkwardly splaying their legs and lowering their necks forward, making them vulnerable to predators. Instead, wild giraffes get much of their liquid intake from acacia (*Acacia* species) leaves, which consist of about 75 percent water. Giraffes are well protected from acacia trees' sharp, four- to six-inch-long thorns by virtue of nostrils that can fully close and a thick mat of hair on their upper lips.

The National Zoo's two Masai giraffes (*G. c. tippelskirchi*) feed mainly on alfalfa hay and water. (Sadly, the Zoo's male giraffe, Ryma, died February 9, just as this issue was going to press.) However, in order to simulate the acrobatics that giraffe tongues must perform when foraging for acacia leaves, Zoo staff have installed four-inch-long metal bolts in the giraffes' feeders to serve as harmless, mock thorns. This enrichment program should make munching alfalfa more challenging and engaging for the Zoo's leggy leaf-eaters.

A hop, skip, and jump away from the giraffes, giant pandas Mei Xiang and Tian Tian are demonstrating their own appetite for culinary curiosity. Lorie Tarou, a research assistant at the Zoo, is interested in understand-



THE BAMBOO-CRUNCHING GIANT PANDA.

ing how giant pandas find their food. Giant pandas (*Ailuropoda melanoleuca*) are known, somewhat oxymorically, as herbivorous carnivores, being descendants of meat-eating mammals but having evolved into bamboo specialists. Therefore the usual assumptions about foraging don't apply. Many herbivores return frequently to reliable locations for food and therefore possess

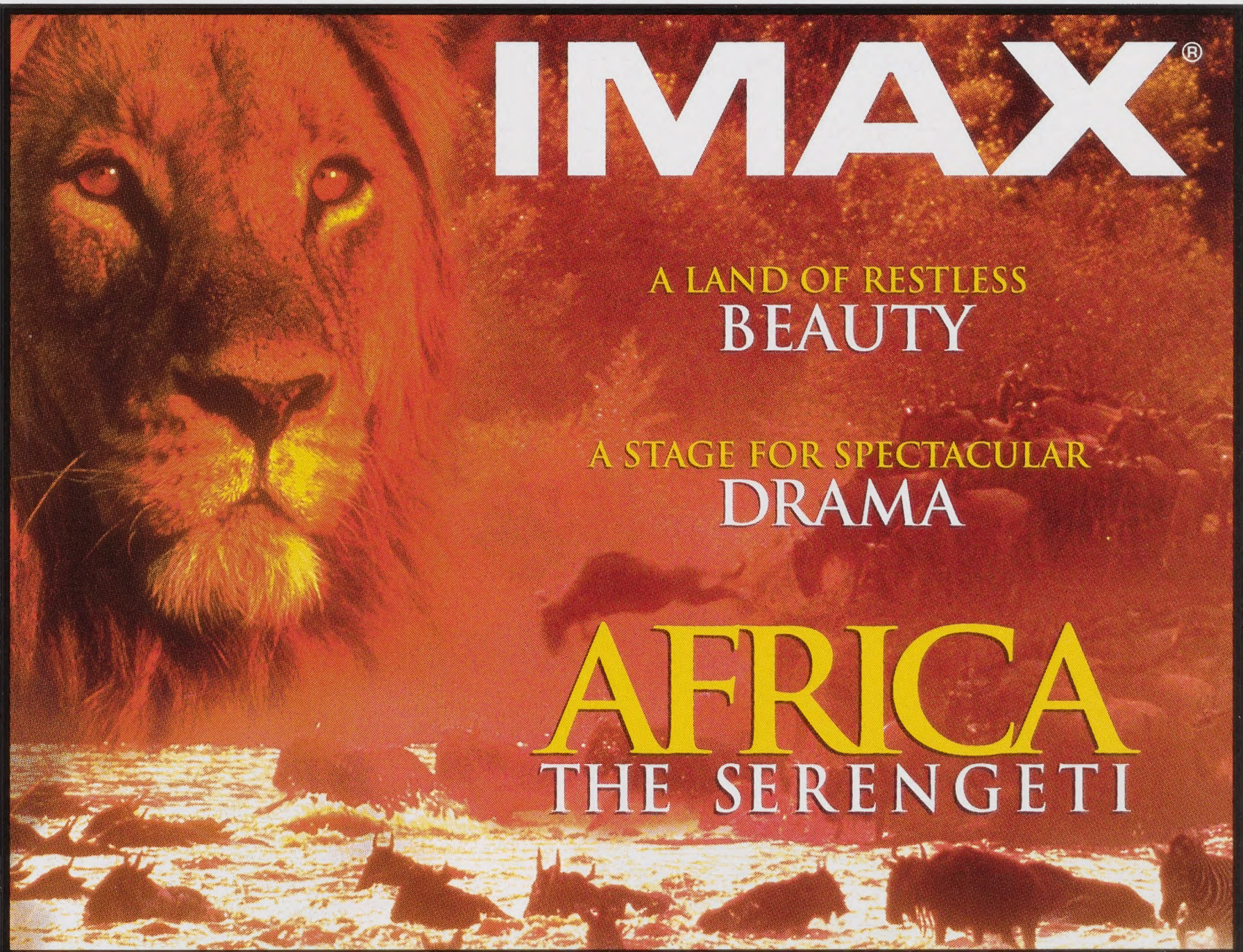
good spatial orientation and memory skills. The adaptations that carnivores use to hunt prey—such as speed, keen eyesight, and smell—are quite different. So where does a bamboo-eating bear fit into the equation?

To help solve this riddle, Zoo staff will lay out in the pandas' outdoor habitat a series of plastic food bowls with hinged lids that either contain food or are left empty. Mei Xiang and Tian Tian will be released outside individually and given the opportunity to discover and consume any food they can find in the strategically placed feeders. Over time, Tarou will start changing the distribution patterns of the feeders and adding variables such as colors and scents. She will then observe how, and how quickly, Mei and Tian adapt. Tarou hopes to determine whether giant pandas use their visual, olfactory, or spatial abilities—or a combination of these skills—when foraging.

Mei Xiang and Tian Tian will be put to the test individually each morning for the duration of the experiment. Visitors to the Fujifilm Giant Panda Conservation Habitat can observe the proceedings firsthand from the rooftop viewing area. Results will be combined with those from similar tests on the pandas at Zoo Atlanta and the San Diego Zoo. Once completed, the study will be among the first ever to report on the cognitive skills of giant pandas.



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BY JOHN TIDWELL

Making Room for elephant





US

SHANTHI STANDS ABOVE HER FIRST OFFSPRING, KUMARI. SHANTHI'S SECOND CALF, KANDULA, WAS BORN ON NOVEMBER 25, 2001, HERALDING THE DAWN OF THE NATIONAL ZOO'S NEW ASIAN ELEPHANT PROGRAM.

JESSIE COHEN/NZP



n an unseasonably warm, rainy Sunday afternoon in late November last year, a little elephant was born at the Smithsonian's National Zoological Park. His birth was special, not simply because he was a cute, 325-pound baby with big dark eyes and a trunkful of attitude. Nor was it only because he was the National Zoo's first male elephant ever, or that it was the Zoo's first elephant birth using a unique bit of medical acrobatics. Rather, this little elephant is special because of what he is: a symbol of all that zoos are trying to achieve with wildlife today.

Kandula gained about 50 pounds in his first six weeks, perfectly normal for an Asian elephant (*Elephas maximus*). But the circumstances of Kandula's very existence—and the lives of his family members here at the Zoo—are anything but normal. Kandula was born with tremendous excitement and weighty expectations upon his furry shoulders: a brave new hope for endangered species.

THE LITTLE PRINCE

Kandula is at it again. Shaking his scruffy head at Zoo visitors. Pulling his mom's tail. Splashing in muddy puddles. Throwing straw at crows that

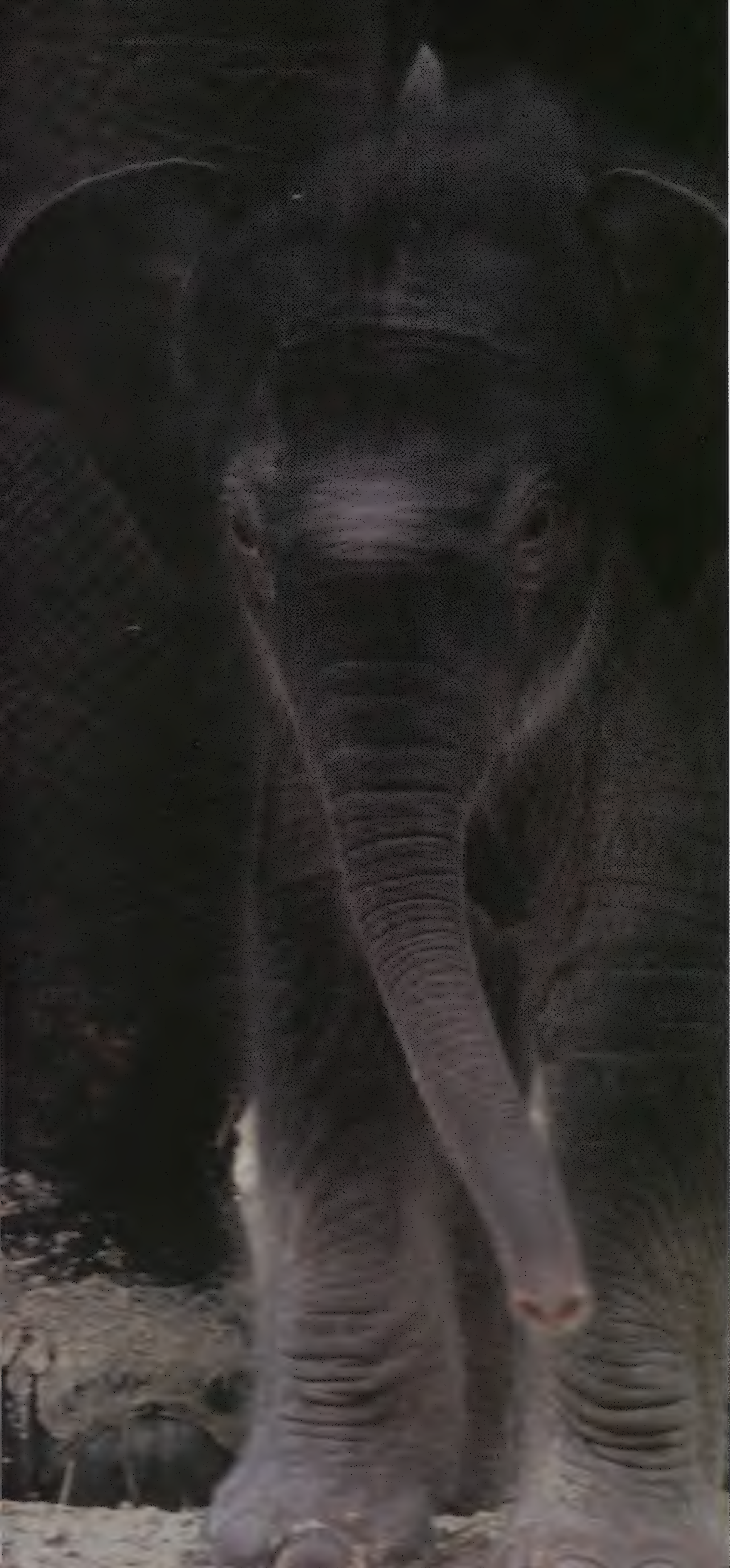
intrude upon his private kingdom and generally keeping his caretakers on their toes.

"He's just all boy," reflects Marie Galloway, the head Elephant Manager and Kandula's constant companion. "He was feisty practically from the moment he was born. As soon as he hit the floor his head was up and he wanted to get up."

Small and slender, with a bob of brown hair, Galloway hoists a wheelbarrow of elephant alfalfa while Kandula leisurely suckles at the breast of his mother, Shanthi. Now 26, Shanthi probably won't have any more babies. Elephant cows often get *meomyomas*, uterine cysts that impede pregnancy as they approach 30. But Shanthi has

proved a patient and devoted mother. Quietly munching from a bale of hay, she lets Kandula play about her tree-trunk legs and make rude gestures at his two elephantine "aunts," Ambika and Toni, Shanthi's long-time roommates. Ambika, the 53-year-old matriarch, tolerates the calf with a dignified air and is always careful to stand between rascally Kandula and Toni, 33, who is nervous and sometimes unpredictably aggressive.

Both of Kandula's parents are of Sri Lankan origin, and the Sinhalese name found for him is apt, evoking indomitable courage and strength: Kandula was the name of the Royal War Elephant



VALUABLE EXPERIENCE GARNERED FROM THE BIRTH OF SHANTHI'S FIRST OFFSPRING, KUMARI (BELOW), AIDED NATIONAL ZOO EFFORTS TO SAFEGUARD HER SECOND INFANT, KANDULA (LEFT).

of the Sri Lankan King Dutugemunu (161-137 B.C.) who helped his master unite the island under his rule.

Already Kandula has become one of the National Zoo's most celebrated and cherished animals during a banner year of births that included a male western lowland gorilla (*Gorilla gorilla gorilla*), a Sulawesi macaque (*Macaca nigra*), a Sumatran tiger cub (*Panthera tigris*) named Berani, and a Masai giraffe (*Giraffa camelopardalis tippelskirchi*) named Jana.

In recent years the National Zoo's veterinary staff have been pioneering the frontiers of elephant reproductive science. Kandula is one of a handful of Asian elephants born through a form of artificial insemination first explored here at the Zoo. National Zoo reproductive physiologist Janine Brown also perfected a hormone test that allowed vets to know days in advance that Shanthi would deliver early. Because of this high degree of care and expertise, Kandula's birth went largely without a hitch.

But the ease of this success belies a hard truth that zoos and circuses have struggled with for more than 100 years. For all their might and size, elephants have proved one of the most difficult species to breed. Over the past century, there have been only 132 elephants born in North America, according to American Zoo & Aquarium Association (AZA) records. Of those, 62 are alive today. The great majority of American births have occurred in the last 40 years, since a budding conservation movement began to shift zoos' focus away from importing elephants from the wild.

When Seattle showman Morgan Berry let two of his young elephants stay at the Portland Zoo (now the Oregon Zoo) in 1962, no one realized that one of them, an Asian cow named Belle, was pregnant. In April of that year, she gave birth to a 225-pound male calf named Packy, the



JESSIE COHEN/NZP

JESSIE COHEN/NZP



WITHIN HIS FEW FIRST WEEKS OF LIFE, KANDULA WAS ALREADY DISPLAYING A BOISTEROUS, PLAYFUL PERSONALITY.

first American birth in 44 years. The resulting publicity vaulted Portland's zoo into the position of "world capital" of zoo elephant breeding: For the next 20 years, roughly one baby was born there per year. However, Portland's prolific pace diminished after 1976, when the Convention on the International Trade in Endangered Species (CITES) and the U.S. Fish & Wildlife Service outlawed international trade of wild elephants in order to curb the rampant global ivory trade.

Suddenly U.S. zoos and circuses were limited

to the small elephant population already living in North America. With elephant births rare, serendipitous events and with no access to wild stocks, U.S. zoos faced a rapidly dwindling pool of elephants.

Potential pachyderm moms and dads were



JESSIE COHEN/NZP

KANDULA WAS THE NAME OF THE ROYAL WAR ELEPHANT OF THE SRI LANKAN KING DUTUGEMUNU (161-137 B.C.) WHO HELPED HIS MASTER UNITE THE ISLAND UNDER HIS RULE.

widely scattered among hundreds of zoos and circuses, often living in small groups or alone. To address this problem, the AZA created a coordinated Species Survival Plan (SSP) for Asian elephant breeding in 1985. The Asian Elephant SSP authorized AZA member zoos to share their an-

imals and record births in a studbook to track the number of elephants in the program and to whom they were related in order to maintain a diverse gene pool. But while the frequency of elephant births in American zoos had increased by the mid-1990s, nearly half of the calves born died before their first birthday. And no one knew why.

THE PRINCESS AND THE PLAGUE

Kandula was not Shanthi's first baby. In 1991 the National Zoo wanted to breed Shanthi with a bull

named Indy who lived at the Rosamond Gifford Zoo in Syracuse, New York. So staff decided to do what most zoos participating in the Asian Elephant SSP did at that time: They put her on a train and sent her up to Syracuse. Marie Galloway went along to keep the 8,800-pound

animal calm and provide expertise in handling her. Shanthi had never seen a male before, but by November of 1992 she was pregnant and on her way home. Twenty-two months later she gave birth to a dainty female calf, the first in the National Zoo's history. The elephant staff named her Kumari, which means "Princess" in Sinhalese.

Kumari became the main attraction at the Zoo and formed a very special bond with Galloway. She was also a favorite of Nancy, the Zoo's savanna African elephant (*Loxodonta africana*), who often tried to sneak Kumari away from Shanthi—without success. A year passed, and things seemed to be going well. Then one Saturday in 1995, Kumari seemed to have lost her appetite. In the days that followed, her health declined, and one afternoon while Galloway was trying to give her a bottle of milk, she noticed the little elephant's tongue was a purplish blue instead of pink. Kumari died a few hours later after intensive staff efforts to save her. It was a devastating blow to the Zoo, and one that still brings tears to Galloway's brown eyes.

"Kumari was just a joy, just a pure joy," she says wistfully. "Baby elephants are so full of their own personalities, full of fun, causing trouble, catching on to things so quickly. And then you watch it one day just end. To see a little life like that stripped before it even has a chance is really hard."

Harder still was not knowing why she died. Richard Montali, the Zoo's head pathologist, was familiar with reports of baby elephants dying around the country and enlisted the help of a young pathology resident, Laura Richman, to try to solve the mystery. When they examined Kumari's internal organs, Richman and Montali noticed evidence of internal bleeding in the heart and liver, with peculiar damage to the cells of blood vessels. Closer inspection of these cells revealed the presence of purple areas called "inclusion bodies," the telltale mark of a viral infection. But what virus?

With support from Friends of the National Zoo's new "Kumari Fund," Montali and Richman examined medical reports from zoos around the country to see if there were any clues to the identity of the virus. After a year of dedicated sleuthing, Richman discovered the killer: a form of herpesvirus previously unknown to science. Now a virologist at Johns Hopkins Medical Center, Richman says the Elephant Endothelial Herpesvirus (EEHV) kills by infecting the cell

Everybody knows there are two kinds of elephants: Asian elephants and African elephants. Well, everyone may be wrong.

Asian elephants (*Elephas maximus*) stand eight to ten feet tall at the shoulders and have humped backs, domed foreheads, small ears, and a single prehensile "finger" on the tips of their trunks. African elephants (*Loxodonta* spp.) tend to be bigger (as much as 13 feet tall at the shoulders), with a sloping forehead, a straight back, and two "fingers" on their trunks. Five million years ago, Africa was actually home to many species of elephants, including one species, *Elephas recki*, that was the ancestor of modern Asian elephants and was more closely related to woolly mammoths than to the African elephants we know today. Something happened—a plague, a shift in food or climate, no one knows—and *Elephas* suddenly vanished from the scene, leaving Africa and their large-eared cousins behind forever. Loxodont species, which had been confined to the continent's forests, then emerged as the dominant pachyderm in Africa, with some moving out onto the grasslands and gradually diverging from their forest brethren.

Scientists now believe there are not one, but two—or even three—species of African elephants. It all stems from recent genetic research published in the journal *Science* last August by Stephen O'Brien and his laboratory team at the National Cancer Institute in Frederick, Maryland. O'Brien's team compared tissue samples taken from

savanna elephants, which live primarily in the wide grasslands of eastern and southern Africa, with samples from forest elephants, commonly found in the jungles of West and Central Africa. For years hunters and scientists had noticed that forest elephants tended to be smaller and have straighter tusks than their savanna brethren. But an analysis of their genes found that the two varieties of elephant are as different from each other as lions are from tigers, and should therefore be classified as two separate species. Forest elephants are now labeled *Loxodonta cyclotis* to distinguish them from their savanna cousins (*L. africana*).

Furthermore, while there is very little genetic variation from one savanna elephant herd to another, forest elephants are highly diverse, and their family tree resembles a bush rather than a branching oak. O'Brien believes that at some point, probably during the Pleistocene epoch around two million years ago, large areas that once were thick forest shrank and disappeared, perhaps as a result of drought. Small enclaves of forest remained, like leafy green islands, and each island harbored a different population of forest elephant. Wetter times eventually returned, and the forests of the Congo again spread out across the land, joining the elephant populations once more. But the genetic "footprint" of those millennia of isolation remains in the DNA of every forest elephant today.

At the National Zoo's research laboratory, geneticist Lori Eggert has been comparing the DNA of elephants from the Tai Forest of West Africa to those in the Congo. She found that the Tai Forest population's genes were as different as *L. cyclotis* genes are from those of *L. africana*. To Eggert this suggests that a third species of African elephant may be warranted, adding another chapter to the study of these African giants.

ASIAN ELEPHANTS GATHER IN A STREAM IN SRI LANKA.



**HOW MANY
ELEPHANTS ARE THERE?**

JOHN TIDWELL

JOHN SEIDENSTICKER

The great white elephant was sick, and King Thibaw, the last god-king of Burma (1875-1885) was in a panic. White elephants had been sacred throughout Asia for centuries as symbols of a king's might and the favor of the gods. So he loaded his favorite palace elephant with treasure: Sprays of diamonds to ward off evil spirits hung from its forehead, huge jewels were set into each tusk, golden pendants dangled from its ears, and about its neck a gold plaque was inscribed with the beast's royal titles. At all times the elephant was shaded with a jeweled umbrella and a huge mirror reflected its splendor. Yet only a mile away in the thick forest that surrounded the palace, elephants of ordinary hue labored through the mud under the whip, pulling enormous teak logs to build more glories for the king.

For 5,000 years, Asian elephants have had a complex relationship with humans, and still are cast in the contradictory role of being both exalted and exploited, rare and unwanted. As the number of Asia's elephants dwindles and their once mighty forests shrink into tiny green islands, the issue of where elephants truly belong in a human-dominated world arises with greater urgency than ever before. Once Asian elephants numbering in the millions ranged from Babylon to southern China, in as many as three different species. When human civilization developed in Asia, elephants were an integral part of its flowering. Elephants' great strength was used to build cities and defend ancient empires from Siam to Rome. The Hindu pantheon of gods included Ayravana, the war elephant of the god Indra, and Ganesha, the elephant-headed son of Shiva who brought prosperity and wisdom to his devotees.

Today, as the great forests of Asia are cleared and leveled for agriculture and the timber industry, its elephants are rapidly vanishing. In 1900 there were some 100,000 wild elephants throughout India, mainland Southeast Asia, and the islands of Sumatra and Borneo. Now that number has been reduced by half. As the jungles recede, elephants have less and less habitat to live and feed in, and when villages spring up along ancient elephant migration routes, elephants often clash with humans. Conflict also erupts when hungry elephants encounter lush plantations of their favorite foods: bananas and sugar cane. Entire harvests can be destroyed in a single night, and for many impoverished villagers their entire livelihood as well.

Today the most dramatic example of this has occurred on the Indonesian island of Sumatra, where less than a thousand wild elephants now live in a handful of small rainforest reserves in central Riau province. The reserves are surrounded by enormous palm plantations, which produce oil that is used in everything from kitchen soap to industrial plastics. Local subsistence farmers also regularly hunt or plant crops illegally inside these reserves. The Indonesian government, still reeling after the crash of the Asian economy, has no money for park rangers so law enforcement around the Riau wildlife reserves is virtually non-existent. When elephant herds venture out to dine on tasty oil palms or raid village crop fields, both elephants and people

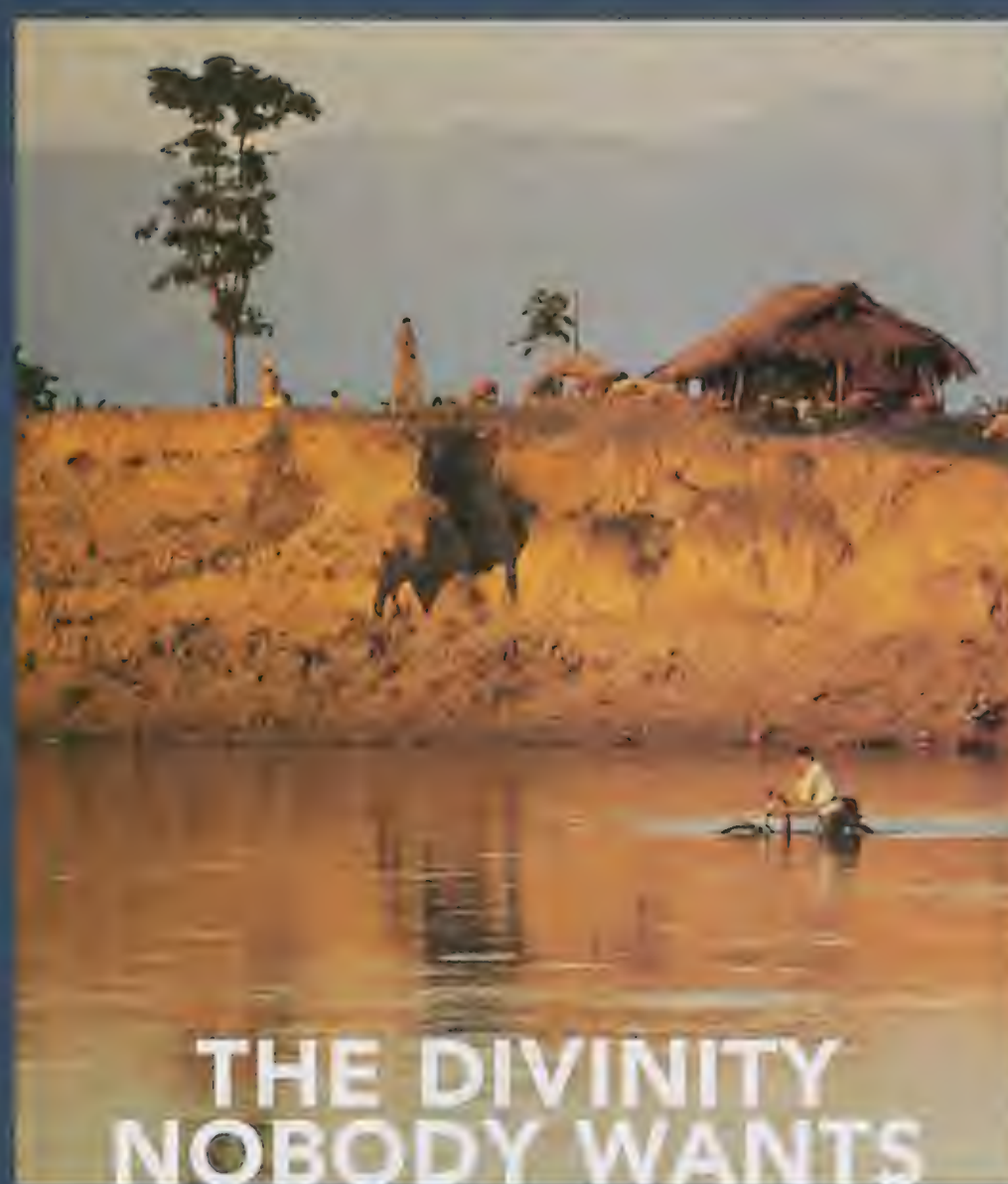
end up dead. Elephants caught off the reserves that are not killed are often held in one of hundreds of "elephant orphanages" on Sumatra that, according to the National Zoo's Christen Wemmer, are more like concentration camps.

"These elephants are refugees of deforestation," says Wemmer, head of the Zoo's Conservation and Research Center. "They get no real veterinary care, they often suffer from malnutrition, and they basically just idle their lives away in these camps. Wildlife is not a priority for the Indonesian government. Palm oil plantations are."

Some of the most powerful conservation organizations in the world, including the World Wildlife Fund, Fauna & Flora International, the

International Elephant Foundation, and a constellation of other organizations have taken up the cause of the Sumatran elephants and have found the Indonesian government cooperative if unable to help financially. Traditional elephant handlers, called mahouts, were even flown in from Thailand because the Sumatrans had no idea how to manage wild elephants. For now, three-way negotiations between Western conservation organizations, the Indonesian government, and palm oil companies are continuing, but Wemmer isn't very optimistic. He explains that the biggest problem is that most Sumatrans are more interested in making money from oil palms than saving elephants, and it's a hard point to argue with desperate people who often see wilderness as equivalent to underdevelopment.

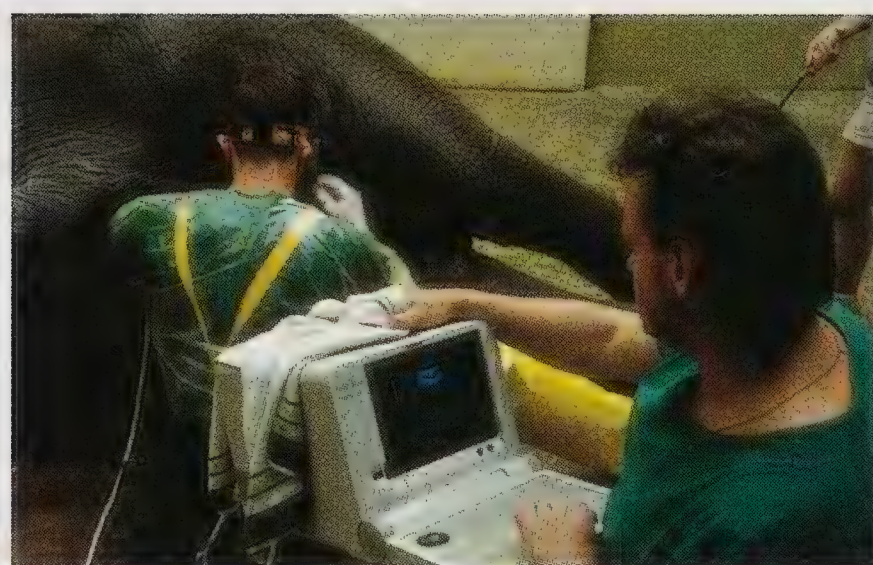
"They would be very happy if they could ship every elephant off that island to Western zoos," Wemmer says sadly. "Elephants just aren't part of the picture for them."



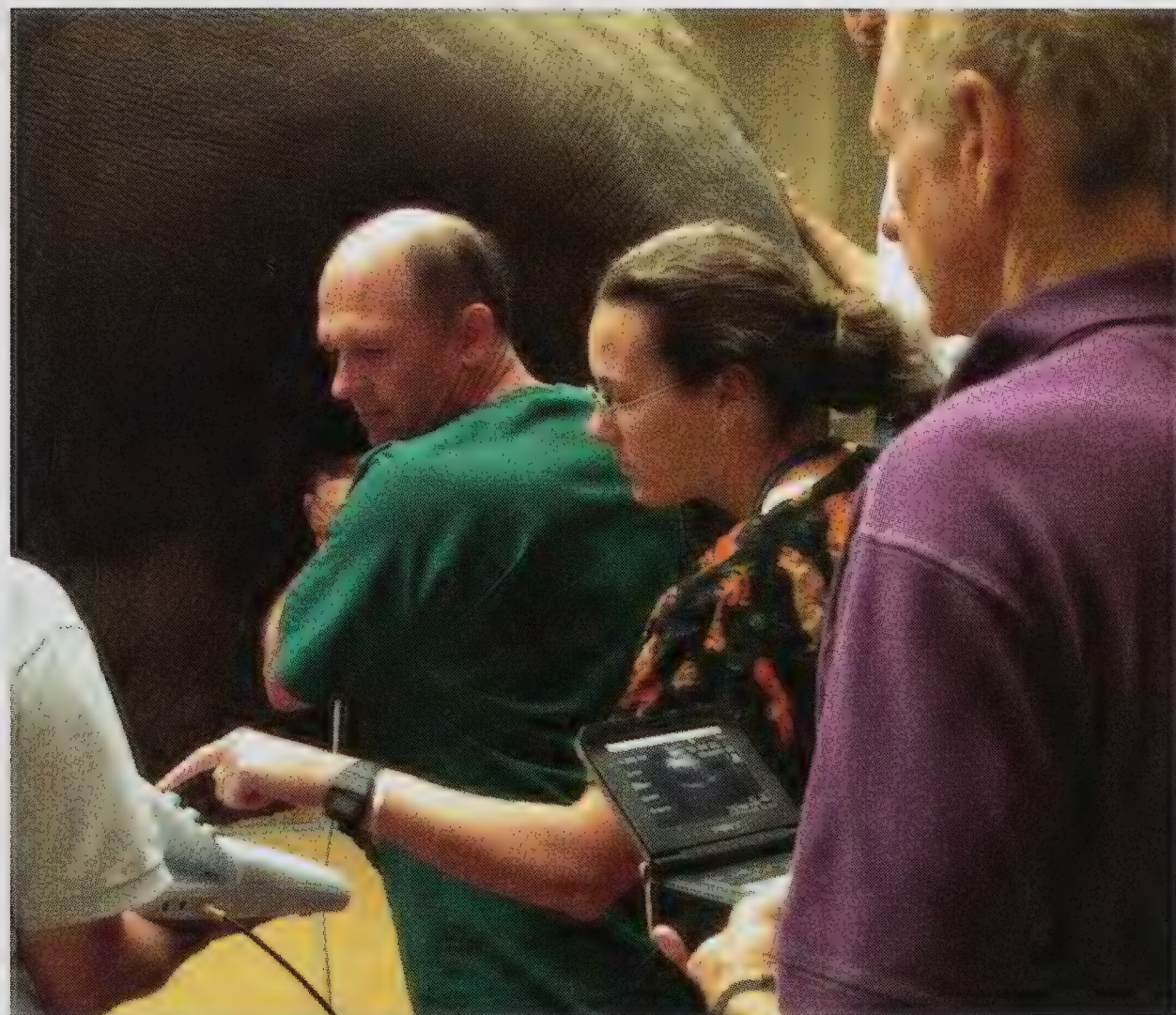
JOHN TIDWELL

JOHN SEIDENSTICKER

AN ULTRASOUND ALERTED ZOO STAFF THAT SHANTHI WAS PREGNANT, SETTING THE STAGE FOR MONTHS OF DEDICATED VETERINARY CARE BEFORE THE LONG-AWAITED BIRTH.



JESSIE COHEN/NZP



JESSIE COHEN/NZP



JESSIE COHEN/NZP

the virus—which often kills within days of its first symptoms—and a general lack of knowledge about when and how much of the drug an elephant should get. Now when a baby elephant gets sick zoos can send a blood sample to Richman's lab in Baltimore and get a diagnosis within eight to 12 hours. But, so far, there is no way to test for

Montali says that three cases of the EEHV-1 virus have been reported in Asian elephants in India, one at a zoo and two at a logging camp where working elephants occasionally have contact with wild populations. So far, no one has studied the disease among wild elephants there. Here at the National Zoo, Kandula has shown no symptoms of herpes, and neither have Asian elephants Shanthi, Ambika, or Toni, although Montali says there is always the danger of latent EEHV virus hiding inside one of them, somewhere.

the latent virus in healthy animals and, as yet, no vaccine.

There are, however, clues to the source of EEHV. Richman says this particular strain of herpes is probably millions of years old and actually quite rare. And she has a strong, if unproven, sus-

THE MATING GAME

When Shanthi met Indy one brisk day in March 1991, it wasn't love at first sight. Both needed a lot of coaxing—nearly 20 months' worth—on a honeymoon that cost the National Zoo an

...ELEPHANT ENDOTHELIAL HERPESVIRUS (EEHV) KILLS BY INFECTING THE CELL WALLS OF CRITICAL BLOOD VESSELS IN THE HEART, LIVER, AND TONGUE (HENCE THE PURPLE COLOR), PUNCHING HOLES IN THE CELLS SO THEY CAN NO LONGER HOLD BLOOD. DEATH RESULTS FROM MASSIVE INTERNAL HEMORRHAGING AND HEART FAILURE.

sies) of other baby elephants as far back as 1983, it became clear that at least eight had been misdiagnosed cases of EEHV. Richman says that in death, Kumari may well have saved the lives of countless other baby Asian elephants.

"Before Kumari...we didn't even know the virus existed," she explains. "We didn't have any idea what the clinical signs of this virus were...Today we have identified 26 cases of the virus in Asian elephants around the world, and we know how to treat it."

The EEHV virus is now considered the number-one killer of elephants under age one. Of the 26 in the U.S. who have so far tested positive for the disease, 22 have died, even after being treated with the anti-viral drug famciclovir. According to Montali, the problem lies in the swiftness of

picion about who Kumari got the virus from: Nancy, the African elephant.

According to Richman, her research shows that there are not one but two EEHV viruses, both originating in Africa. And while the EEHV-1 virus is lethal to Asian elephants, it causes only benign skin nodules in Africans, apparently resulting from a tolerance built up over centuries of exposure to the disease. The second herpes virus, EEHV-2, is apparently as deadly to African elephants as EEHV-1 is to Asians. Montali says that when zoos keep African and Asian elephants together the virus may get transmitted. Since the discovery of the virus, zoo officials and the AZA have been discussing a change in zoo policy to keep species separate, Africans with Africans and Asians with Asians. Perhaps even more ominous,

elephantine \$20,000. But the number of Asian elephants in the U.S. was small, estimated at only a few hundred animals, and the population in the AZA's SSP program was even smaller. To make matters worse, since the 1990s zoos in North America and in Europe have been facing a serious shortage of breeding-age elephants. According to AZA's figures there are only nine Asian elephants among the SSP's 81 member zoos today who are between 14 and 25, the best age range for elephants to reproduce. Most of the other Asians are too old. The gene pool and fecundity rates for African elephants in the SSP are equally dire.

"The captive population of elephants is not reproducing at a rate fast enough to sustain itself," states Lucy Spelman, Director of the National Zoo. "And one of the reasons for that

in the U.S. is we have a decentralized situation in which we have a handful of elephants spread out among many different zoos.”

her trainer. She gets a lot of attention and elephant biscuits. All we ask of her is to stand still. And Shanthi is real good at standing still.”

barrier between elephant and handler. Bulls can be espe-

WHEN SHANTHI MET INDY ONE BRISK DAY IN MARCH 1991, IT WASN'T LOVE AT FIRST SIGHT. BOTH NEEDED A LOT OF COAXING—NEARLY 20 MONTHS' WORTH—ON A HONEYMOON THAT COST THE NATIONAL ZOO AN ELEPHANTINE \$20,000.

How to get more Asian elephants? Going back to importing elephants from Asia is a solution that's not only anathema to many conservationists but also expensive and difficult. According to Asian Elephant SSP Coordinator Mike Keele, to take an elephant out of India, for example, a zoo would have to prove to the U.S. Fish & Wildlife Service that to do so would not violate any CITES regulations and would be a significant boon to both the individual elephant's welfare and to the wild pachyderm population.

While U.S. zoos have imported a few elephants in recent years, mostly from Malaysia, the number is too small to make a significant impact on the number of elephants in North America. In fact, most zoos have found it difficult and expensive even to shuttle females here in the U.S. from one facility to another for breeding. Transporting males for breeding is considered too dangerous due to their great strength and aggressive nature. All of which put the National Zoo and its lone breeding-age cow Shanthi in a spot. Should the staff try another expensive gamble to transport Shanthi hundreds of miles to another male and hope she became pregnant again?

Enter Thomas Hildebrandt, an expert in animal reproduction from Berlin's Institute for Zoo and Wildlife Research. In the late 1990s, Hildebrandt and his colleagues had been developing a new way to artificially inseminate elephants. This procedure is actually more difficult than it might seem because the reproductive tract of a female elephant is a labyrinth of twists, turns, and blind alleys. But advances in fiber optics, three-dimensional ultrasound, and elephant science brought artificial insemination (AI) within Hildebrandt's reach, and when a collaboration with Janine Brown at the National Zoo was arranged, Shanthi turned out to be an ideal, four-ton guinea pig.

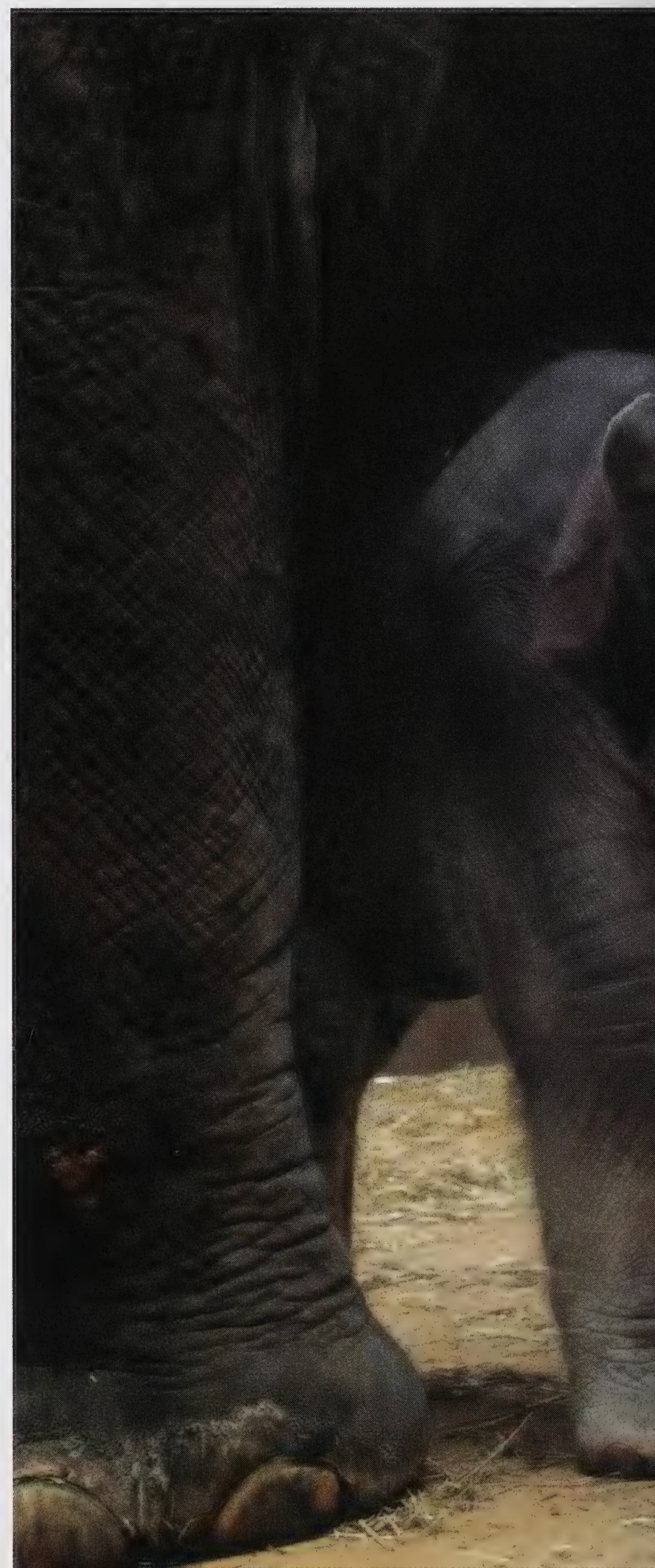
“She actually seems to rather like the process, especially the ultrasound,” says Marie Galloway. “She is fully awake and unrestrained except by

Hildebrandt perfected his unique method on Shanthi and used it successfully on two other elephants in the U.S. before it was Shanthi's turn to try for another baby in February 2000.

With six or eight vets around her, and \$100,000 worth of sophisticated equipment inside her, Shanthi was successfully impregnated with sperm flown in fresh from a good-looking bull named Calvin, who then lived in Calgary, Canada. A year and a half later Kandula was born. It was a moment of triumph on many different levels: Kandula was only the fifth birth following artificial insemination in the world, and the National Zoo's second baby elephant. His health and vigor seemed to dispel the lingering ghost of Kumari and fears of another death. Kandula also changed the very nature of elephant keeping at the Zoo—because he is a male.

Bull elephants are trouble. They are often larger than females, weighing up to 13 tons. Unlike females, Asian males have sharp tusks and during the breeding season enter musth (Hindi for intoxicated), when huge amounts of testosterone surge through their bodies, making them ferocious, utterly fearless, and totally focused on one thing: females. Not surprisingly, bull elephants have not been the sex of choice to exhibit in most zoos and circuses. Traditionally, zoos train milder-tempered females through “free contact,” in which keepers can work with elephants without any barriers. Facilities that can safely hold a bull elephant are not only massive and expensive but also must employ “protected contact,” a form of elephant management that always keeps a sturdy

cially difficult to handle during musth, when most of their training is forgotten in the frenzy, making elephant managing one of the highest-risk



KANDULA, THE ZOO'S FIRST MALE ELEPHANT.



JOHN SEIDENSTICKER

ELEPHANTS HAVE BEEN AN IMPORTANT PART OF MANY ASIAN CULTURES FOR THOUSANDS OF YEARS (LEFT), YET THE LOSS OF HABITAT FOR WILD ASIAN ELEPHANTS NECESSITATES CREATING A VIABLE ZOO POPULATION TO SAFEGUARD AGAINST EXTINCTION.

jobs in America. But in spite of all this, zoos have had to face the obvious fact that to get babies, some AZA facilities must keep bulls.

In the forests of Asia, wild elephant herds are matriar-

chal, with a dominant female surrounded by her daughters and grandchildren. Males form loose affiliations with one another and often live on the

periphery of the herd, mingling with the females when the males come into musth. But until recently this was not the way Asian elephants lived in zoos or circuses. Since they were first brought to North America in the 1700s, elephants have lived largely isolated lives, often in tiny quarters, singly or in pairs. As more has been learned about these great mammals in the wild—and as it has become clear that members of multigenerational pachyderm families communicate by touch, sound, and smell—the more people have realized that elephants should live communally in zoos. But few zoos have had the resources to house and breed a herd of ten to 15 elephants.

Ironically, the most successful facility to keep an entire elephant herd came from a traditional rival of the conservation movement: the Ringling Bros. and Barnum & Bailey Circus. Since the early 1990s, Ringling Bros.’

zoo community do not dispute Ringling’s methods and are slowly changing facilities to reflect this new way of keeping elephants. Eventually, high-tech measures like artificial insemination may not be needed to produce healthy babies. By the time Kandula reaches adolescence, the Zoo habitat he and the other elephants inhabit will have changed radically.

As part of its ten-year plan for an Asia Trail, the National Zoo is developing a new elephant facility that will be able to accommodate bulls and house as many as six cows as well. Still in the design phase, the habitat will be reminiscent of a South Asian forest, with wide, winding trails nearly a mile long that will not only allow visitors to view the elephants in different places, but will also provide vital exercise to keep the pachyderms’ physiques in top form.

The facility will also creatively incorporate both free and protected contact forms of elephant management. A new 25,000-square-foot elephant

SINCE THE EARLY 1990S, RINGLING BROS.’ CENTER FOR ELEPHANT CONSERVATION (CEC) IN CENTRAL FLORIDA HAS TAKEN ON THE MANTLE OF “ELEPHANT BREEDING CAPITOL OF THE WORLD.”

Center for Elephant Conservation (CEC) in central Florida has taken on the mantle of “Elephant Breeding Capitol of the World,” while remaining resolutely unaffiliated with the AZA. But no one can deny its breeding successes. Today Ringling has a herd of 70 elephants spread among its two performing circuses, its breeding facility, and its “retirement center.” The CEC alone has 26 elephants, with four pregnant cows and 11 successful births. But they have also had setbacks. Six of their 11 calves have died young, one from herpes.

“We probably have the most successful breeding program outside of Southeast Asia,” says John Kirtland, head of the CEC. “My feeling is if zoos are truly committed to elephant conservation they need to expand their herd size, and they need to be willing to keep multiple males.”

Politics aside, most members of the

barn will include a bathing pool and separate areas for males and females, with the option of romantic rendezvous when the time is right. By 2007, the new elephant area will be ready to replace Kandula’s current home, which was built in the 1930s. Spelman envisions the project as a crucial step in the global commitment to save Asian elephants—one that begins with the visitor.

“This is an incredible opportunity to say, ‘Here is the story about being an elephant and why we are building them a bigger place to live. And here is why it’s important to preserve them as a species.’” Z

—John Tidwell is a Washington, D.C.-based freelance journalist who often writes on conservation issues. His last story for ZooGoer, on Africa’s bushmeat crisis, appeared in the September/October 2001 issue. He can be contacted at midnightsea@erols.com.

To follow Kandula’s progress, visit nationalzoo.si.edu for regular updates.



JESSIE COHEN/NZP



EUROPEAN BEAVER (*CASTOR FIBER*) IN FRANCE.



BEAVER LODGE IN GRAND TETON NATIONAL PARK.

AT THE ZOO: BUSY BEAVERS

BY AMY HIMES

NORTH AMERICAN BEAVER (*CASTOR CANADENSIS*) FEEDING ON WILLOW.



O my friend Ahmeek, the beaver,
Cool and pleasant is the water;
Let me dive into the water,
Let me rest there in your lodges;
Change me, too, into a beaver!

—Henry Wadsworth Longfellow,
"Song of Hiawatha" (1855)



Metro Orange Line. 5:10 p.m.

The man sitting next to me on the Washington Metro subway car peers over my shoulder and asks what I'm reading. I flip the book over to show him the cover.

"Beavers...ah, beavers," he says, throwing his head back and gazing past me with a faraway look in his eye.

"I used to shoot 'em and skin 'em. We'd blast 'em out with dynamite."

"You what?"

"Well, you know, we'd spend our summers hunting beavers. You could get \$20, well, no, maybe up to \$40 for their hides. That was a lot of money in those days."

"Where did you hunt beaver?" I ask.

"Western Colorado. There were so many beavers then," he says. "Are there any beavers around Washington, D.C.?"

"Sure," I tell him. "Remember the news stories from a few years ago about the beaver downing the cherry trees in the Tidal Basin?" Park Service officials were certain that a beaver was the culprit, as the trees had been gnawed through, leaving a pointed stump remaining—the rodent's trademark. They quickly removed the felled trees in an effort to thwart the beaver's natural urge to build a dam. A family of three beavers was eventually trapped and relocated.

At one time beaver populations were found throughout the Northern Hemisphere. The domain of the European beaver (*Castor fiber*) extended from Portugal and the British Isles all the way into northern Scandinavia, Siberia, and Mongolia. After being hunted to extinction in the British Isles—and most of Europe and Asia—European beavers now remain in only a few small pockets of their former range.

The North American beaver (*Castor canadensis*) inhabits much of the continent, with the exception of the northernmost Yukon, arid areas of the southwestern United States, and some coastal areas in the southeast. Otherwise, the industrious rodents—once on the verge of extinction in North America—inhabit almost every forested area from coast to coast and from the Gulf of Mexico north to the Arctic Circle.

Healthy forests are crucial to beaver survival. Their sickle-shaped teeth are adapted to serve as tools for chipping and gnawing through wood. Like

many rodents, these animals must wear down teeth that grow continuously throughout their lives. The cutting action of incisors wears down the surface of the teeth at the same time it sharpens them. Without the constant abrasion, a beaver's teeth may grow too long, making the animal unable to eat.

Beavers prefer to eat softwood trees that are only a few inches in diameter and they select some of the most abundant and fastest-growing trees in North America, including aspen, poplar, and willow. Their diet may also include grasses, fruits, fungi, lichens, and water plants. Beavers choose smaller trees because they are faster to fell and are easier to carry. Since time out of the water leaves beavers vulnerable to predators—such as hawks, wolves, foxes, bears, and coyotes—felling smaller trees allows the beaver to finish business and head for cover faster.

That cover is the water of streams, rivers, and lakes where these busy engineers of the forest build their lodges and dams. With webbed hind feet, short front legs, and flaps in the mouth, throat, and eyes that evolved especially for life in the water, beavers are excellent divers that may stay beneath the surface for four to five minutes at a time. But these aquatic rodents haven't managed to hide from their most prolific predators: people.

THE FUR TRADE

"I've felt a beaver fur," I say.

"Huh?" my Metro seatmate replies.

"At a museum on Mackinac Island, in Michigan, I felt beaver's fur. All sorts of furs were laid out for people to touch: otter, red fox, raccoon, muskrat, squirrel, and beaver."

The beaver's fur was plush, the richest and softest fur on display. Beaver fur consists of two coats: an inner undercoat and an outer coat. The outer "guard" hairs, which give the beaver its grayish or rusty brown color, are coarse, thick, and shiny due to oil produced by oil glands. A beaver grooms its fur by using its front feet to spread the oil discharged from its cloaca, a cavity that serves as an exit for the intestinal, genital, and urinary tracts in beavers and certain other primitive mammals. This special oil is critical in waterproofing the fur. The fur's slick, smooth texture helps the beaver glide through water easily. Beavers molt their outer coats during the spring and

BEAVER BASICS

ANCIENT GIANTS

One of the largest members of the rodent family, beavers evolved from the so-called giant beavers—*Castoroides* of North America and *Trogontherium* of Europe—that roamed the Earth more than one million years ago. Dated remains suggest that giant beavers lived as recently as 10,000 years ago. These beavers may not have depended upon water as much as their successors, as no evidence suggests they built dams. Rather, they lived in large burrows in the ground. The species resembled the modern beaver, only much, much larger. With a massive tail more than two feet long and incisors up to six inches long, some fossilized specimens were as large as a black bear.

DAMS AND FAMILIES

Beavers live an average of ten to 12 years in the wild. They generally mate for life and live in family units that consist of an adult male and female and three to four kits. Once they are old enough to leave the nest, kits spend most of their time playing in the water around the lodge, but are buoyant and cannot dive. Young beavers usually stay with their parents—helping out with the family business of maintaining the lodge and dam—until they reach sexual maturity at about two years of age. Then, chased away from their natal territory by their parents, they go stake their own claim, often downstream.

NATURE'S BUILDERS

Beavers cut trees and drag them to the water to form dams and lodges. Using any rocks or branches lodged underwater or on the bank to build upon, beavers begin adding branches hauled to the water. Lodges are mounds built in the middle of the water, usually not far from the dam. Each lodge has one nesting chamber located above the water's surface and several entrances through underwater channels. Wonderful diggers, beavers may also burrow underground tunnels from the banks up to favorite feeding grounds and excavate channels to other parts of the stream or river. Beavers eagerly maintain their structures by patching them with branches and mud scooped from the floor of the waterway or pool. At times, flooding or storms may destroy lodges and dams, but many withstand the weather.

ENGINEERING THE ECOSYSTEM

Beaver dams prevent the normal flow of water, flooding the banks of waterways and creating pond environments. These pools attract many insects, birds, and other creatures that thrive in still water. Certain animals—such as fish that must migrate long distances up or down a river—may not benefit from the beaver's work, and may perish. Flooding caused by the dam may also kill engulfed trees, plants, and insects. But beavers also encourage new life, as they create a marshy area. New insects are attracted to dead wood, and the dampened soil encourages new trees to sprout and grow. As beavers cut trees, branches then grow from the remaining stumps, providing beavers with fresh food.

BEAVER AT THE ZOO.



summer months.

The inner layer of fur consists of fine, soft hairs that pile over the entire body except the feet and tail. Not only is the undercoat dense, the hairs' rough scales cause it to mat together, trapping and insulating air that warms the animal in freezing weather. Beavers' fur, adapted to their watery environment, helps the animals keep warm and dry during extremely cold winters. Unfortunately for beavers, these same qualities have made their pelts highly desirable to humans.

Early written laws in Britain declared the beaver as property of the king. Beaver fur—a symbol of royal power—was hemmed to the borders of the royal family's robes and other garments. Its fur could cost up to five times more than the fur of other animals. In the 1600s, the colonization of North America led to explosive trade in pelts. Native Americans hunted the beavers—hacking their lodges, shooting them with bows and arrows, catching them with their hands, or setting traps—in order to exchange the fur for settlers' goods. By 1670, the Hudson's Bay Company, a monopoly licensed by Britain's King Charles II, harvested all the fur from watersheds leading to the bay.

The monopoly fostered competition over trapping territory between the English, Native Americans, and French—and helped spark the French and Indian War.

The beaver fur trade also encouraged

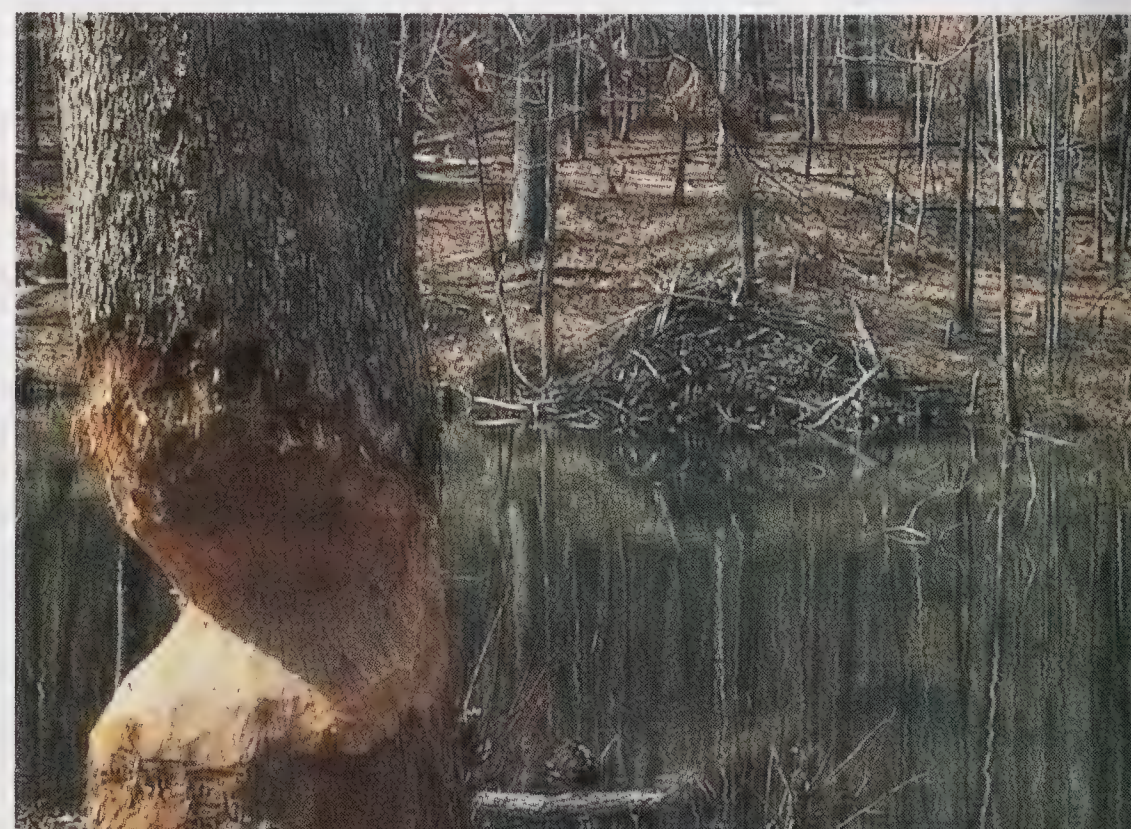
settlement and exploration of the West. Cities such as Albany, St. Louis, and Mackinac City were founded by the trade. The New York City seal depicts a beaver, as do many Canadian and English family crests. According to many historians, the beaver—a symbol of industry and perseverance—contributed more to the development of North America than any other animal.

"Mackinac beavers made the first millionaire," says Jeff Dykehouse, the Mackinac Island interpretation supervisor and chief naturalist of Michigan's historic parks. Controlling this fort built by British soldiers during the American revolution, John Jacob Astor chartered the American Fur Company in 1808, a business that helped him die the richest man in America. According to Dykehouse, five to ten beaver furs were traded for every one fur of all other animals in the Mackinac and Great Lakes trade combined. "Hundreds of thousands of beaver furs went through the straits of Mackinac, because it was located halfway in-between [many major Canadian trading posts] and Albany," he says.

Hunters usually trapped beavers but would also employ other methods, such as cutting holes in ice. Beavers use such holes for access to food and fresh air and are easily caught as they emerge. Another method was attacking lodges while blocking the openings for escape, trapping beavers inside. Hunters even destroyed dams to lure the animals, as beavers instinctively react to the sound of rushing water in order to safeguard their structures.

By the early 1800s, beaver fur trade reached its height amid an expanding consumer market. Hundreds of thousands of pelts were shipped each year from Canada to Europe. Men's felt hats

TELLTALE MARKS OF A GNAWING BEAVER.





BEAVERS ARE GRADUALLY PADDLING BACK INTO RIPARIAN ECOSYSTEMS ACROSS NORTH AMERICA.

were the fashion rage in Europe and the United States, placing heavy demand upon beaver fur. In the 1830s, when buffalo hunting's popularity grew and trade with China made silk the newest fashion, the beaver went out of style, although some hunting and trapping has continued to this day.

NOSE TO TAIL

Unlike my Metro acquaintance who sought beavers only for their pelts, many people hunted beavers for another reason, one originally considered far more valuable than fur.

Castoreum, an oily substance produced by the castor glands, is a strong-smelling compound that beavers use to mark territories and identify other beavers. Two castor glands—each measuring up to four inches long in adults and found near the base of the tail—emit the castoreum liquid through the cloaca. Beavers create mounds of mud about one to two feet in width and height to scent-mark their territory along the edges of waterways. Adults visit these sites almost daily to deposit castoreum. A powerful signal to other beavers, the scent may be detected from a distance, warning potential intruders to stay away.

In ancient times, healers in Europe and North America used castoreum to treat fever, gout, epilepsy, toothache, tuberculosis, arthritis, and other ailments. The Greek Hippocrates—considered the father of medicine—recommended castoreum for its healing powers. In the Middle Ages, Europeans used it as a cure for snake and spider bites, deafness, poor eyesight, tumors, and even bad memory. Incidentally, castoreum has been found to contain small amounts of salicylic acid, which is found in the bark of one of the beaver's favorite trees, the willow. Salicylic acid is

the active ingredient in aspirin.

By the early 1800s, the height of the beaver fur trade saw thousands of pounds of castoreum shipped to Europe from Canada. Because the dense, oily compound absorbs scents and releases them slowly, perfumers added fragrances to castoreum. Castoreum has been used as a base to which fragrances are added even in modern times.

People hunted beavers for other reasons besides furs and glands. Native Americans hunted the animals for meat long before Europeans arrived in North America. During the Middle Ages in Europe, beaver tail was considered a delicacy fit for royal dining. In the 18th century, when

many people considered beavers to be fish, Catholics were allowed to eat these mammals during periods in which other meats were banned.

If you walk into a Canadian bakery today, you'll likely find "beaver-tail doughnuts"—a (meatless) fried pastry with a waffled pattern in the shape of the beaver's distinctive paddle-like tail. Often mistaken for its

smaller rodent cousin, the muskrat,

the beaver is best recognized by this broad, flat tail with hard ridges that look like scales. The tail—its center an extension of the spine—may grow to about 18 inches long and six inches wide. Fat inside the tail serves as a source of stored energy and temperature control for the body. Beavers use their tails as a rudder when swimming, as a balancing device when gnawing trees or dragging limbs, and as an alarm when slapping the water.

GOOD NEWS

"I haven't seen any beavers," the man on the Metro says, "but I hear they're making a comeback, aren't they?"

Indeed they are. In North America alone,

beavers, which originally numbered anywhere from 60 to 400 million before nearly going extinct, are now thought to number six to 12 million. The animals remain threatened by water pollution, reclamation of wetlands, and hydroelectric plants. Beavers are being reintroduced into pockets of the United States, Scandinavia, and Russia from which they had vanished. However, such introductions may cause problems. If the North American beaver is introduced into Europe and Asia, evidence suggests that it may out-compete the native species. Also, farmers and ranchers complain of flooding and damage to crops, fields, and roads in places where beavers have returned.

Nonetheless, people are gradually learning to coexist with beavers—and for good reason. Beavers play a major role in their ecosystems by creating ponds where many species of plants and animals can thrive. Reservoirs control runoff and erosion. Beavers help maintain a healthy natural environment—for animals like us.

As the man slowly stands to exit the Metro, I ask him, "How long did you hunt beavers?"

"We did that for several summers," he says, then hesitates. "And then we got better jobs." Z

—Amy Himes is a former ZooGoer intern.

Because beavers are generally nocturnal, the best time to see the Zoo's five beavers—the father, Cleaver, mother Granby, and their three offspring, Chipper, Buzz, and Willow—is during daily feedings usually at 1 p.m. A recent expansion to their outdoor exhibit allows them to forage for branches and logs on dry land during the afternoon. Beavers and other North American species will be highlighted during **Seal Days** at the Smithsonian's National Zoological Park on March 23 and 24 from 10 a.m. to 4 p.m. (see "Notes & News," page 6).



BEAVER LODGE



**THE
BUSTARDS:**

PUFFIN

JUN

RUNNING

TOWARD OBI

A MALE GREAT BUSTARD (*OTIS TARDA*)
IN GERMANY PUTS ON QUITE A
DISPLAY FOR THE PHOTOGRAPHER—
AND FOR FEMALE BUSTARDS NEARBY.



TIM OSBORNE

RUEPPELL'S BUSTARD
(*EUPODOTIS RUEPPELLII*).

BY HOWARD YOUTH

ELEPHANT, ZEBRA, AND WILDEBEEST
TAILS SWISHED TO THE RHYTHM
OF CLICKING CAMERA SHUTTERS.

While my safari mates tore through film, my eyes drank in a three-foot-tall, pointy-headed fowl calmly walking among Ngorongoro Crater's drowsy game. For years, I'd read about African, European, Asian, and Australian bustards and longed to make one's acquaintance. Finally, I saw for myself what at first looked like a cross between an ostrich and a monitor lizard. Except for feathers, the kori bustard seemed reptilian, with piercing yellow eyes, thick long legs ending in tiny feet, a stiletto-like bill, and a long gray-and black-peppered neck.

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BENGT LUNDBERG/BBC NATURAL HISTORY UNIT



JESSIE COHEN/NZP



FROM LEFT: GREAT BUSTARDS IN EAST GERMANY; MALE KORI BUSTARD AT THE NATIONAL ZOO; WHITE-QUILLED KORHAAN (*EUPODOTIS AFRAOIDES*).

Suddenly, the driver lurched our Land Rover forward, pursuing a black rhino that just crossed the dusty road. At that moment, I looked ahead and saw another bustard in the dirt ahead of us. As we bore down upon it, the huge bird skittered on lanky legs and laboriously flapped, slowly rising from the road. It barely cleared the Land Rover's roof before veering to safety on the straw-yellow plains.

Although dwarfed by elephants, kori bustards (*Ardeotis kori*) and Eurasia's great bustards (*Otis tarda*) are jumbos of the bird world. Males of each species weigh up to 33 pounds—about as much as two Thanksgiving turkeys—and share the flying-bird heavyweight title with only one other species: the mute swan (*Cygnus olor*). But bustards' champion status belies the fact that biologists are just learning the details of their flashy lives. And not a moment too soon. Bustards and people don't generally mix well. This bad chemistry leaves bustard populations reeling: Of the world's 25 bustard species, most are in decline, and many have disappeared from broad stretches of their former ranges. A few may soon go extinct.

Most bustards inhabit grasslands or dry bush country in Africa, where biologists believe the family got its start some 70 million years ago. Two species—the great and little bustards (*Tetrax tetrax*)—range from Europe eastward into Central Asia, three others haunt Asian steppes, while one slinks around Australia's Outback and a grassy bit of New Guinea. One of the most widespread, the houbara bustard (*Chlamydotis undulata*), lives from North Africa to Mongolia.

Over the millennia, bustards evolved into a diverse family best known by ornithologists for lavish and distinctive courtship displays. Dr. Suess could not have conjured up more off-the-wall

rituals. Each breeding season, males flamboyantly compete for females' attention on traditional staging areas, or leks. Some species strut, some run, and others quake, flap, and puff out their plumage. Consider the houbara, a pheasant-sized bird native to fragile desert fringes. Males of this species run while puffing out shaggy white chest and crown feathers. With their heads buried in fluff, preoccupied competitors sometimes slam into things standing in their path. Male little bustards beep while jumping three feet above their grassy surroundings, while India's endangered lesser floricans (*Sypheotides indica*) reach greater heights. These endangered black and brown birds launch up to six feet high in a second, rattling their wings in a routine that males repeat more than 500 times daily during courtship.

Other bustards, including greats and koris, transform themselves into puffballs, flipping much of their plumage upside down in energetic fits of pomp. This past April, ten miles outside Spain's capital Madrid, I watched ten male great bustards blink on and off like lights from about a half-mile away across wheat and fallow fields. Through a spotting scope, I saw them twist their wings, tip their tails over their heads, swing their necks back and puff out their chests, exposing all-white feathered areas. Thick-necked and up to three times the size of females, these posturing males are "like a bunch of bodybuilders doing incredible displays—they're very contorted," says Nigel Collar, an ornithologist at the Britain-based conservation organization BirdLife International.

Although I couldn't see them, female bustards watched the exhibitionist males from nearby cover. These invisible spectators really run the show, quietly slipping onto leks of the few most dominant and showy males and copulating with them. Although many bustards' breeding habits

remain poorly understood, five African species in the genus *Eupodotis* are likely monogamous; in the rest, like the great bustard, males usually mate with multiple females. After mating, females go off on their own to lay their eggs on a scantily covered but well-hidden patch of earth, while most males leave the area to feed in male-only flocks. After a month's incubation, great bustard chicks hatch and run after their mothers within a few hours. Hens cram protein-rich insects down the chicks' throats and youngsters tag along with them until the next spring, then strike out on their own.

INVISIBLE WANDERERS

Outside breeding season, many bustards lead nomadic lives, seeking plants and small animals wherever food supplies hold up against often-severe heat and drought. Most species eat their share of agricultural pests. Kori bustards, for example, frequent locust swarms, feasting upon African farmers' worst winged nightmares. A diet study published in 2000 in the British journal *Ibis* found that houbaras must each consume about 670 desert invertebrates daily to meet their energy needs. A sampling of the mixed bag taken by another species hints at bustards' opportunistic nature. Australian ornithologist Kate Fitzherbert describes the Australian bustard's (*Ardeotis australis*) diet as "a wide variety of insects, particularly grasshoppers, small vertebrates including native and introduced rodents, reptiles, and small birds, seeds, leaves and fruits, and also mollusks and centipedes."

Bustards' plant menu selections sometimes get them into trouble. For instance, sub-Saharan farmers consider the Arabian bustard (*Ardeotis arabs*) a pest because it nibbles acacia saplings planted for the extraction of gum arabic, an in-

FINALLY, I SAW FOR MYSELF WHAT AT FIRST LOOKED LIKE A CROSS BETWEEN AN OSTRICH AND A MONITOR LIZARD.

gradient in pharmaceuticals and soft drinks. Europe's great and little bustards feed on alfalfa much of the year, and leaves of other legumes such as vetch and clover are also featured on bustard menus. But farmers often plant these crops to infuse nitrogen into their soil rather than for harvesting. Conservationists now encourage farmers to increase their legume acreage as a way to benefit the declining birds. By and large, bustards do

tard study, tried to unravel some of the kori bustard's best-kept secrets. "Amazingly, but true," says Hallager, "no one has studied these large, conspicuous birds to this extent in the wild before."

Hallager worked with Osborne to collect kori blood for DNA studies. "We wanted to compare the two subspecies of kori bustard to see how different or alike they really are," she says. One

Osborne has also radio-tracked Namibian kori bustards since 1997, fitting captured birds with lightweight radio tags attached by a harness. In the future, Osborne wants to monitor the birds via satellite because, he says, "We have never been able to find any juvenile males after our initial tagging. Their dispersal is beyond our limited radiotracking means." Osborne's work paints a different picture of a bird once assumed to stay put.



A KORI BUSTARD (*CHORIOTIS KORI*) FLIES ABOVE THE SERENGETI IN KENYA.

farmers more good than harm, and they're rarely abundant enough to cause severe crop damage.

Despite the males' brash breeding displays, bustards spend much of their lives slinking unobtrusively through wide grassy or bushy spaces. Hidden in often remote habitats, many bustards long escaped biologists' attention. For example, nobody knows the courtship and mating rituals of three African species, the Nubian (*Neotis nuba*), Heuglin's (*Neotis heuglinii*), and little brown bustards (*Eupodotis humilis*). Huge gaps remain in what is known about more familiar species like the kori.

Last year, Smithsonian's National Zoological Park animal keeper Sara Hallager, who cares for the Zoo's burgeoning bustard flock [see "The Zoo's Bonus Bustards," page 27], spent two weeks in Namibia. There, she and Tim Osborne, a retired Alaskan biologist now dedicated to bus-

population, *A. k. struthiunculus*, lives in tropical East Africa and the other, *A. k. kori*, is found far to the south, mainly on grassy plains and in tree-dotted and scrubby savanna. Hallager and Osborne caught ten bustards by slowly guiding them into fine-meshed nets strung between scattered trees. Next, they drew blood samples and weighed and measured the birds before releasing them. Back in the United States, tests performed by the Zoo's Genetics Lab revealed substantial differences between the two subspecies' mitochondrial DNA. "This suggests that the two populations may indeed be separate species, although further testing may be necessary," says Hallager. If declared separate species, the two bustard populations would likely receive more attention from conservationists, who will need to take a careful look at plans to protect not one but two kori bustard species.

"We now know that koris have similar movements to the great bustard, with some migrants, some residents, and some a mix of the two, depending on drought affecting insect abundance," he says.

For more than a decade, Juan Carlos Alonso, a biologist at Madrid's National Museum of Natural Sciences, and his colleagues have tracked Spain's great bustards, studying their biology, population demographics, and conservation needs. They debunked the myth that great bustards are sedentary. "Through marking and tracking them with radios, we have observed that they move up to 150 miles between breeding sites and summering and wintering sites," says Alonso. Without electronic spying equipment, the biologists would have remained in the dark about great bustards. "They really are horrible things to study," recalls Collar, who spent his months in



BLACK-BELLIED BUSTARD (*EUPODOTIS MELANOGASTER*) IN SOUTH AFRICA.

Portugal cramped in a blind, sneezing from blowing pollen. “Just trying to figure out where the females are is amazingly difficult.”

THE CASE OF THE HARRIED HOUBARA

Cryptically colored, shy, and often active only at night, dawn, or dusk, houbara bustards also give biologists headaches. Recent satellite-tracking work, however, revealed bizarre migration patterns in Asia’s heavily hunted houbaras. Wintering birds captured and tagged in the United Arab Emirates (UAE) flew to nesting areas in Kazakhstan, Uzbekistan, and China. Yet only one of these birds returned to the UAE to winter, and it was a Chinese bird that had tackled a round-trip journey of 7,400 miles—not bad for a chunky bird! The others turned up in Iran and Afghanistan.

“The main problem with bustards is the generally low priority accorded to the conservation and sustainable use of grasslands, steppes, and range lands throughout the world,” says Paul Goriup, an ecologist who until last year was the chairman of the Bustard Specialist Group of the World Conservation Union. The houbara illustrates Goriup’s point. Under bushes and amid grasses, houbaras find not only important plant foods and cover but also safe places to seek mates and form flocks outside breeding season. On their dusty, mostly open habitats, the most “lush” areas still might have less than 20 percent vegetative cover. In a paper published in *Ibis*, biologists Yolanda Van Heezik and Philip J. Seddon found that houbaras breeding in Saudi Arabia’s Harrat al-Harrah reserve—home to Saudi Arabia’s last wild houbara breeding population—chose different habitats depending upon season and available vegetation. The biologists concluded that “reserves set aside for houbara bustards should be extensive, diverse, and largely free of livestock, human occupation, and its associated disturbances.” Much of the houbaras’ former Saudi Arabian habitat no longer fits the bill. Even the reserve might not protect many. The researchers concluded that only about 25 percent of the property is preferred houbara habitat, such as dry washes and lake beds, leading them to wonder if the birds still bred there because of reduced

hunting and grazing pressure, rather than because the reserve was the best habitat.

Another part of the houbara's saga illustrates that while habitat loss is enemy number one, other threats often compound the birds' troubling situation. For instance, wealthy falconers from Middle Eastern countries travel across North Africa, Pakistan, and other places to set their raptors and rifles on Arabian, Nubian, and especially houbara bustards. One BirdLife International estimate puts the annual toll taken by falconers to be at least eight percent of the Asian houbara population. Meanwhile, local subsistence hunters throughout the birds' range zero in on the birds, while cattle chew up their habitat. Even where protection laws are on the books, such as in Kazakhstan, houbaras still fall to hunters and falconers.

MORE DANGER IN THE GRASS

Far off in Australia, the retreat of the Australian bustard echoes that of the houbara, but with different twists. "Bustards have all but disappeared from southeastern Australia and are less abundant elsewhere," says ornithologist Fitzherbert, who works at the Hobart-based Australian Bush Heritage Fund. "The main reasons for this are loss of habitat in southeastern Australia—caused by a combination of intensive agriculture, invasion of native grasslands by woody weeds, and also by hunting and fox predation." Native acacias rank high among the encroaching weeds, spreading because grassland-sustaining fires—once commonly set by hunting Aborigines—are now suppressed. Introduced red foxes (*Vulpes vulpes*) prey on the birds, while other introduced animals—rabbits, sheep, and cattle—damage their



KORI BUSTARD CHICK
BORN AT THE
NATIONAL ZOO.

THE ZOO'S BONUS BUSTARDS

HOWARD YOUTH

On October 3, 1997, keepers celebrated a record-setting moment—the first hatching of a kori bustard at the Smithsonian's National Zoological Park. On that day, the Zoo became only the fifth in the world, and third in the United States, to breed this beefy bird. And it was no trouble at all. In fact, it was a delightful surprise.

Four years ago, three females and a male kori bustard lived in a grassy yard behind the Bird House. (Today, you can see four adult females, two adult males, and a juvenile male living there.) The keepers never saw the male perform his flamboyant puffball courtship display and assumed that the bustards would not mate. So when the female began incubating an egg in September 1997, the keepers guessed that she sat on a dud. But 20 days later, when the female briefly left the nest, keeper Sara Hallager peeked at the egg and saw it move. Keepers moved the egg to an indoor incubator, away from crows and other predators. Three days later, a fuzz ball the size of a barnyard chick broke out of the egg. Since that first nesting in 1997, 15 bustard chicks have hatched and grown at the Zoo.

The National Zoo and other institutions have joined in a formal Species Survival Plan that coordinates kori bustard zoo breeding. Hallager keeps the international studbook for koris, coordinating breeding records among 35 zoos. In March 2000, the Bird House received a bustard loaned from the Bronx Zoo/Wildlife Conservation Society's breeding facility on St. Catherine's Island, Georgia. Although the bird did not breed there, he changed his ways when he reached the Zoo. "Within three months he was siring chicks," says Hallager. "This was very exciting because it opens up the potential for moving non-breeders through breeding centers as one possible method of increasing genetic variation in the zoo population." With four successful years under its belt, the Zoo's bustard breeding effort provides inspiration for other zoos trying to save these magnificent birds.

fragile habitat. Due to widespread declines, the species is considered near threatened.

The road is even rockier for other species. Cattle herds trample the endangered great Indian bustard's (*Ardeotis nigriceps*) eggs, inching this species, estimated at fewer than 1,000 birds, closer to extinction following centuries of habitat loss and over-hunting. The Bengal florican's (*Houbaropsis bengalensis*) prospects seem the bleakest of all: As few as 250 birds or as many as 1,000 may survive in isolated, highly endangered habitats along the India–Nepal border and in Cambodia and Vietnam.

The great bustard, despite a once-huge breeding range, is now one of Europe's most endangered birds, primarily due to habitat loss. Birdlife International's Collar dreads what may have happened to the now-troubled Portuguese populations he once studied. "I'm rather frightened to go back to my old study sites," he says. Today, Portugal's declining population supports between 500 and 1,000 birds.

The species has a tiny toehold in Morocco, but this too is slipping away. "I'd say this is one of the most endangered bustard populations in the world," says Alonso, who is involved in efforts to save Morocco's bustards. "The species is protected by law but in Morocco there is little space left for them. They stay in the few places where there is nobody. It's difficult to tell, but we guess there are fewer than 200," he says.

"Spain's is the last great bustard population that may end up surviving in the long- or mid-term," says Alonso. There, about half of the world population—about 20,000 birds—remains more or less stable [see "*España Verde*: Spain's Living Landscape," in the September/October 2001

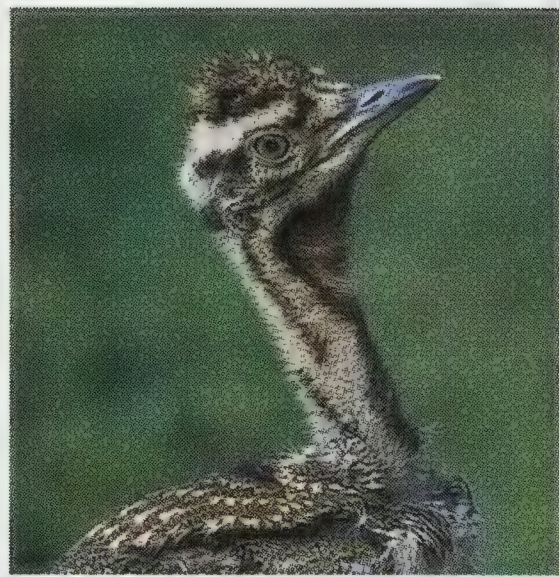
ZooGoer]. “I think the European concern is concentrated on keeping this population alive because other populations have decreased. Take, for example, the case of Hungary, where in only 20 years, the population has declined from about 10,000

to just over 1,000 where it is today.” Yet even in Spain, conversion of traditional and varied farmlands into large-scale, mechanized, often irrigated modern farms wipes out the bustards’ and other grassland birds’ habitats. Most of the birds live in four or five scattered strongholds.

ENOUGH ROOM FOR BUSTARDS?

Setting aside reserves may not save some far-ranging bustards. Entire landscapes must sometimes be conserved because any break in the birds’ wide-open, treeless habitats may block the birds from moving, hampering genetic interplay between populations. The great’s smaller cousin, the little bustard, declined in step with the loss of its once-widespread steppe habitat, disappearing from 11 European countries. A 1994 study published in the journal *Biological Conservation* concluded that to survive, little bustards need expansive, varied mosaics of open areas with vegetation high enough to hide the birds while short enough to allow them to scan for predators. Biologist Carmen Martinez, author of the study, wrote: “I suggest that land managers should be given an incentive to increase the agricultural mosaic in cultivated areas. This could be achieved by the temporary set-aside of cultivated land and by increased cultivation of legumes (an important food).” Similar recommendations have been made for great bustards, but with few encouraging results to date. Despite a decade of talking about such programs in Europe, farmers and conservationists have yet to see eye to eye on how to balance traditional farming practices with a good bottom line.

In the case of little and great bustards, the European Union has mandated establishment of Important Bird Areas (IBAs) in Europe, where farmers should manage the landscape to benefit both themselves and grassland birds. However, local jurisdictions often overstep the goals of these areas, compromising the birds’ welfare with special exceptions—additions like houses, power lines, and roads. Despite this, the plan is the best



YOUNG KORI BUSTARD.

JESSIE COHEN/NZP

international effort yet to assess bustard status and set a course of action. Currently, 74 designated IBAs support great bustard breeding populations in ten countries. IBAs for Africa have just been drawn up, and protective legislation exists in many

countries where declining bustards live. One of the biggest challenges now is sticking to the rules.

Bustards face other dangers as well. For instance, power lines strung between fields kill more individual great bustards in Spain than any other mortality cause since hunting was banned there in 1980. Power line collisions remain a problem throughout bustard habitats, and proper plan-

THE GREAT BUSTARD, DESPITE A ONCE-HUGE BREEDING RANGE, IS NOW ONE OF EUROPE'S MOST ENDANGERED BIRDS, PRIMARILY DUE TO HABITAT LOSS.

ning and placement of these structures, along with roads, will be critical in preserving bustards’ grassy haunts. In addition, widespread pesticide use wipes out the birds’ insect prey, an especially acute danger while young, just-hatched bustards are growing. Other pesticides sprayed in bustard habitat may kill the birds outright.



THE RED FOX, AN INTRODUCED PREDATOR IN AUSTRALIA.

DIETMAR NILL/BBC NATURAL HISTORY UNIT

Returning bustards to former haunts requires hard work, a lot of money, and available habitat, and there are no guarantees of success. For example, in the 1970s, efforts to reintroduce great bustards to Great Britain—where they went extinct more than a century ago—failed. “They came to the conclusion very, very early on that it was impossible to reintroduce the great bustard,” says Collar. “They need very large numbers of in-

sects for their young to develop. We don’t have that volume of grasslands any more in Britain. We don’t even have grasslands. It was an idle dream.” Projects in Austria, Hungary, Slovakia, and the Ukraine met a similar fate or are struggling. Despite the odds, British scientists are again studying the possibility of reintroducing bustards at a grassy military installation near Wiltshire.

Since 1986, a Saudi Arabian zoo breeding and reintroduction program has yielded better results with houbara bustards. This project, run by the Taif, Saudi Arabia-based National Wildlife Research Center, produced more than 1,500 chicks, and hundreds have been released into the wild. In 1995, the first confirmed wild nesting of reintroduced houbaras was documented, nine

years after the project began. However, as the houbara habitat study found,

reintroduction efforts will succeed only if expansive over-grazed areas grow back while grazing and hunting are kept to a minimum.

What does the future hold for bustards? A lot depends upon the species, its available habitat, and the home countries’ ability and willingness to protect them. Often incompatible with people, bustards are “high-maintenance” species frequently requiring human restraint or intervention to prevent their disappearance. Many countries probably cannot make the sacrifices necessary to protect them. Even in affluent countries, keeping bustard habitats intact proves a tough challenge.

Even the kori, that familiar safari sight, has no guarantees. In many parts of its breeding range, populations have dropped and isolated populations have vanished, mostly due to habitat change, including overgrazing. “As long as there are big parks and water-limited areas in southern Africa, the kori will be okay there,” says Osborne. “But if aid money is available to dot the landscape with water holes, then cattle farmers will follow and the birds will slowly disappear.”

—Howard Youth, a Contributing Editor to ZooGoer, admires courting bustards’ bold, brash ways.

The Way of the Tiger: Natural History and Conservation of the Endangered Big Cat.

K. Ullas Karanth. 2001. Voyageur Press, Stillwater, Minnesota. 132 pp., clothbound. \$29.95.

In 1987, K. Ullas Karanth was a student in the National Zoo's Wildlife Conservation and Management Training Program. He went on to earn his Ph.D. studying tigers and today, he is a senior scientist and director of the Wildlife Conservation Society's India program. In years to come he will be recognized as a giant in India's environmental history.

The Way Of the Tiger is his story and what a wonderful story it is. It is also the most up-to-date, comprehensive account of the biology and behavior of these awesome predators available.

"When you see a tiger it is always like a dream," Karanth once said. The most outstanding conservation scientist working in India today, he was a pioneer in putting wildlife conservation in India on a scientific footing. Because of this, as well as his mentoring of a whole generation of students and acting at the highest levels of the Indian government, the tiger will survive in the wild and we will still have tigers to dream about.

Karanth has the rare ability to identify the barriers to wildlife conservation and then break these down into technically practicable and politically feasible scales. Or, as he wrote, "...vision, persistence, thinking at the right social and spatial scales, and constructive dialogue are the keys to the tiger's future." No conservationist is more committed to bringing rigorous science to tiger conservation than Karanth, but he recognizes fully the importance of the right vision and knows that the tiger will be lost without it, no matter how good the science.

In *The Way of the Tiger*, Karanth articulates his vision and presents a road map for securing a future for wild tigers in India. Based on two decades of groundbreaking studies of carnivores and their prey in India's Nagarhole National Park, he argues that it is not poaching or a decline in the amount of habitat that endangers the tiger. After all there is an estimated 116,000 square miles of potential tiger habitat in the Indian subcontinent. It is the quality of this habitat that will determine the future of wild tigers.

The tiger and other large predators and their ungulate prey are in decline in most Indian forests. But in Nagarhole, he has seen how a region can recover, given a chance. In *The Way of the Tiger*, he brings together the ecological information necessary to sustain rare species. He developed a simple axiom: To sustain wild tigers, conservationists must find the ways and means to protect the prey—deer, wild swine, and wild cattle—upon which tigers depend, and to create prey-rich core areas for tigresses to rear their cubs free of human disturbance. Seemingly obvious, this formula was not widely recognized until Karanth went out on the stump and told anybody and every body that this was the only way to save tigers in India. He enlisted students and associates to tell this story over and over. And Indian conservation authorities are beginning to listen.

All of India's protected areas cover only about 20 percent of the forests that are potential tiger habitat. And most of India's major protected areas, including Nagarhole, are home to large numbers of people who legally live and farm and illegally hunt inside their boundaries. This is a major impediment to the long-term survival of these special places. Moreover, there are hundreds of thousands of "crop protection" guns in forest villages, and they are used to vastly reduce the tiger's prey. Freely available poisons from cyanide to various pesticides are used to kill tigers that kill the domestic livestock that inundate these forests.

Yet Karanth was an early proponent of shifting the limited resources available for tiger conservation away from anti-poaching activities and toward retaining and restoring tiger habitats, starting inside protected areas. "Identifying, protecting, and maintaining and monitoring such prey-rich enclaves, embedded within larger landscape matrices under multiple uses, should be the central concern of any future tiger population recovery," he says.

Karanth has shown that it is possible to recover tiger habitats but you have to engage local people living inside and near protected areas in a constructive dialogue and work through the issues involved to a win-win situation. Thanks to his efforts, the people living in Nagarhole have agreed to move to new, better homes. Prey populations are recovering. The tiger survives. His approach can now be adapted to more of India's protected areas.

Many conservationists, particularly in the West, believe high human population density leads to the likely extinction of large carnivores. This is the usual pattern, but not inevitable if wildlife policy and management are effective. In India, a country with staggering human population density, Karanth is making the critical difference in promoting effective policy and management to ensure a future for large carnivores. His courage is clearing a way for other Indian wildlife and conservation biologists to

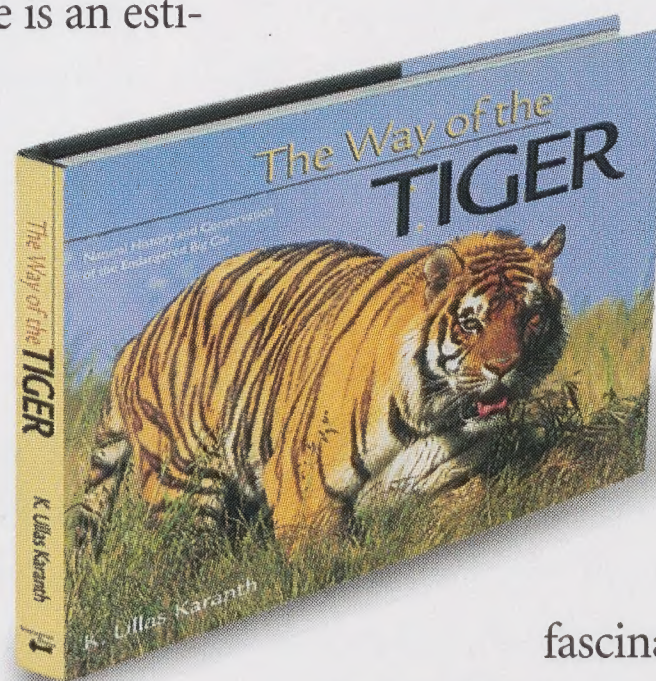
be heard. What he is doing, nearly single-handedly, is changing the entire Indian conservation culture from one based on emotion and opinion to one that is based on science and, equally important, sensitive to people.

Karanth understands that the future of India's rich biodiversity lies in dedicated conservation leadership. His own leadership and perseverance, through great hardship, has emboldened many others to take up the challenge.

This story, which gradually emerges among his fascinating descriptions of all facets of tigers and their relationship to people, is in the end the most compelling part of *The Way of the Tiger*.

You can read it to learn all we know about tigers, or to learn all we know about what—and who—will save them for our dreams.

—John Seidensticker is Senior Curator at the National Zoo and Chairman of the Save The Tiger Fund Council.



GOOD NEWS

Reason for hope arrives from China, where giant pandas (*Ailuropoda melanoleuca*) appear to have maintained a diverse gene pool in spite of reduced and increasingly fragmented populations. Scientists estimate that wild giant pandas are today divided into about 25 populations, most numbering fewer than 20 individuals. Nevertheless, giant pandas in three mountain ranges in central China display a moderate—and "promising"—degree of variation, according to a study by Lu Zhi of Peking University, Stephen O'Brien of the National Cancer Institute, and their co-authors in the December issue of *Conservation Biology*.

The authors emphasize that corridors between isolated populations must be established in order for wild pandas to survive in the long-term. Fortunately, more than 60 percent of giant panda habitat is now protected, and the Chinese government has placed a moratorium on logging in panda habitat outside wildlife reserves.

BAD NEWS

Three of the Grand Canyon's eight native fish species—the Colorado pikeminnow (*Ptychocheilus lucius*), the bonytail chub (*Gila elegans*), and the roundtail chub (*Gila robusta*)—have vanished from the park over the last 60 years. A fourth, the humpback chub (*Gila cypha*), may follow in their wake according to research by the Grand Canyon Monitoring and Research Center (GCMRC). A recent census of the Little Colorado River suggests that only 2,000 to 4,000 chub larger than 150 millimeters (about six inches) remain, signaling a marked decline in the abundance of the species since 1994.

The damming of Glen Canyon and other sections of the Colorado River and its tributaries has drastically altered native fish habitat across the Colorado Plateau. In addition to blocking migratory routes, dams collect water in deep reservoirs typically colder and clearer than what naturally flows in shallow, sediment-rich rivers—thereby favoring introduced, cold-adapted fish like trout over native species. Populations of predatory rainbow trout (*Oncorhynchus mykiss*) and brown trout (*Salmo trutta*) have swelled in the main stem of the Colorado River in Grand Canyon over the last five years, says GCMRC biologist Lew Coggins.

Named for their muscular neck humps that stabilize them in whitewater currents, humpback chubs grow up to 18 inches long, and live as many as 30 years, on a diet of algae, aquatic arthropods, and small fish. Outside of the Grand Canyon, humpback chub are also found in small numbers within the Colorado River and its major tributaries in the Upper Colorado River Basin.

THE RIDDLE OF THE V

Scientists from the Centre National de la Recherche Scientifique in France believe they've discovered why many birds migrate in "V" formations: It saves energy. Eight great white pelicans (*Pelecanus onocrotalus*) fitted with heart monitors were trained to fly behind an aircraft in Senegal. Those pelicans flying in formation were found to use 11 to 14 percent less energy than those flapping solo, report the scientists in the October 18 issue of the journal *Nature*. The birds appear to glide more easily

and often in the vortex wake left by individuals in front of them. Although aerodynamic efficiency has long been suspected as being a benefit of flying in formation, scientists never have had the means to test this hypothesis. Staying in a "V" may also facilitate communication and coordination between flock members.

HORROR HAVEN

The sleepy hamlet of Bodega Bay was engulfed by feathered terror in the 1963 film "The Birds." Now this northern California community has

been named a Globally Important Bird Area (IBA) by the American Bird Conservancy—not for its role in horror film lore but for its significance as wetlands habitat for shorebirds and waterfowl. The region is home to threatened Western snowy plovers (*Charadrius alexandrinus nivosus*), black oystercatchers (*Haematopus bachmani*), black brants (*Branta bernicla*), and other rare bird species. The bay is also haunted, however, by invasive plant species and feral cats that threaten the birds just as ominously as the marauding gulls and crows besieged Tippi Hedren, Jessica Tandy, and Rod Taylor.

Despite her on-screen run-in with phantom fauna, Hedren now heads the Shambala Preserve, a sanctuary for lions and other big cats near Acton, California.

—from www.abcbirds.org

WHAT'S IN A NAME?

No less a scholar than the Roman historian Pliny gave bustards their original Latin name, *avis tarda*, meaning "slow bird." The Latin designation eventually fledged into *abetarda* in Portuguese, *ottarda* in Italian, *bistarde* in old French, and finally "bustard" in English.

Pliny chose the name because Spaniards, he had heard, described these birds as *tarda*, or slow. Pliny's translation, however, might not fly. Rather than denoting tardiness, the old Spanish *tarda*, linguists speculate, may instead share the same origins as the name for bustard in German, *Trappe*, as well as our English words "tread" and "traipse." With powerful legs, bustards are anything but slow, and male bustards do traipse about haughtily when trying to impress prospective mates.

Sadly, the great bustard (scientific name: *Otis tarda*), which was so common in Pliny's time, has become a *rara avis*—a rare bird.

—Alex Hawes



KORI BUSTARD.



Bubble #36-8401(g)

Duties include:
making victory
that much sweeter

enjoy

PHhhuroOOo!

(thanks)



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Kandula was born on November 25, 2001, the result of a successful artificial insemination. Advances in research by Zoo scientists and their collaborators at the Institute for Zoo Biology and Wildlife Research, and others around the world in preserving endangered species brought this miracle to life. Support from FONZ members also played a crucial role. Money provided by FONZ helped to underwrite the cost of the complex procedure, including veterinary staff, travel, equipment, and ultrasonography. Thank you for generously supporting FONZ and our programs. We couldn't have done it without you.

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